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Some Aspects of the Copper Situation

An extravagant advance in the rise of any commodity is never an unmitigated blessing. It may be, and often is, an evil. The producers of copper have many times experienced the truth of these principles and are not unlikely to become aware of them once again. One of the evils is the creation of a spirit of unrest among the men who are paid in wages. If an advance is economically justified, and if the producers are enabled to earn more money thereby, their employees ought to, can and will share the increased profit. If, however, the advance be but ephemeral, or be greatly overdone, the producers are likely to be led to make increases that subsequently will be difficult to cancel.

The recent strikes at the refineries in Baltimore, Brooklyn and Perth Amboy seem to have been stirred up by the malevolent hands of the Industrial Workers of the World, the anarchistic organization led by Hayward, with whom western mine operators are familiar. The avowed purpose of the I. W. W. is to wage war upon the employers of labor. Probably its leaders read in the newspapers of the scarcity of copper and the urgent demands upon the refineries and determined that the refineries would be a good place in which to put a spoke in the wheel. Perhaps this would not have occurred if so much had not been said of the stress upon the refineries and their being the key to the copper situation, etc.

A feature of the recent advance in copper that has been unsatisfactory to many persons, but otherwise to well-wishers for the industry, has been the nondevelopment of an old-fashioned copper stock boom. It is true that most of the standard copper shares have risen in about the same ratio as the metal, but there has been no public excitement carrying prices up to a basis of 5% yield on 17c. copper, and those who have stocks to sell are disappointed. No doubt the public will save money, because there is no probability that copper will average 17c. over a series of years, and besides the best of the copper stocks ought to yield more than 5% on the purchase price.

The absence of public excitement is possibly due to an increase in wisdom, but anyway it may be attributed to suspicion respecting the present situation. Most people are convinced that the last six months have witnessed a substantial improvement in general business, but while that has been slow and orderly, as reflected in the iron and steel markets, the copper market has been crazy, which discrepancy has not easily been reconciled; and, moreover, the mysterious disappearance of the new production of copper has had the effect of creating doubt rather than of inspiring confidence.

The Situation in Cuba

The communications from Mr. Lawrence and Mr. Emerson, published elsewhere in this issue, are illuminative of the situation actually existing in Cuba, and it will, we think, be a revelation to most people that American property has been so greatly in danger. The Cuban government seems to be unable to cope with the situation and Washington has been ignorant, or timid or both. It is high time that the chronic disturbances in this island be quelled permanently and a bold hand should be exerted if necessary. Otherwise there will be no further investment of American capital there for the simple reason that it will be unsafe.

Washington should moreover see to it that an exceptional class of men be appointed to the consular positions not only in this, but in the other South American countries where turbulence endangering Americans is likely to occur. The American consuls in those places should be strong, sane men, who will be leaders

in time of trouble and safe advisers to their countrymen who happen to be around them. The ordinary American political consul is far from being such, and not infrequently is simply a joke. During the recent disturbances at Santiago, the place would have been panic-stricken had it not been for the coolness and bravery of Mr. Emerson and Mr. Combs, two officers of the Cuba Copper Co. The American consul did not seem to figure prominently.

The Telluride Case

An important recent piece of news from Colorado has been the award of $403,000 to the Smuggler-Union Mining Co. in its suit against the Liberty Bell Mining Co. for trespass. The suit was nominally for $600,000.

The Liberty Bell company made an underground discovery of a vein and figuring that its apex came in a narrow gap between the Carruthers and Waters claims of the Smuggler-Union made a location (the Winner claim) covering that gap. The hypothesis being confirmed, as it was supposed, by raises following the vein to the surface, the Liberty Bell proceded to extract ore from the vein.

Later it developed that there were errors in the surveys of one of these raises and also in the lines of the Carruthers claim, and that the apex fell within the Waters claim; and moreover that the outcrop known there was in fact merely a branch of the vein, which had split, the other branch being just within the Carruthers lines.

Under these circumstances the Liberty Bell company became a trespasser, which we understand was recognized by its management. The Smuggler-Union company was the injured party and was entitled to redress, which has now been given to it. As to the extent and some other phases of the matter we are not going to comment. The point of general concern is that the verdict as it stands is a reflection upon the Liberty Bell management, which, in our opinion, is unfair. We are sure that Mr. Winslow and Mr. Chase would not steal ore from their neighbor, or from anybody else, and most people will believe with us that their trespass was unintentional. If any criticism is to be directed toward them it is for lack of care in surveys with respect to an apex supposed to lie within a width of only 28 ft. of free ground, but even as to this there were extenuating circumstances. It is a pity that this case, which is another troublesome manifestation of our absurd law of the apex, could not have been settled out of court.

A Long Raise

There has been some talk recently of records made in shaft sinking, particularly on the Rand, mention of which was made in the JOURNAL of June 1. The Rolling Mill No. 2 iron mine, in Michigan, is now engaged in some shaft work, which, while it does not constitute a record as far as time and speed are concerned, is, nevertheless, interesting. While good time was made in the initial work, the chief interest lies in the method followed.

It was decided, for various reasons, to drive a vertical shaft by raising from the 620-ft. level to surface. Other considerations aside, this in itself is a long raise. The completed shaft will be 12x14 ft. in size, but the raise was driven 8x8 ft. Nine miners did the work in five months, working three 8-hr. shifts per day. In addition to the actual work of drilling, these men also did the timbering and trammed the rock a distance of 750 ft. To facilitate the work, under these conditions, the raise was driven as a three-compartment opening, one long, narrow compartment and two smaller, square ones being used. Holes were drilled and blasted in such a manner that the greater part of the broken rock was thrown, by the force of the blast, into the same compartment, at each firing round. Last, but not least, a light type of drill was employed, known as the butterfly-valve, air-hammer, stoper drill. In that district, at least, the use of such a drill for shaft work is a departure. There is reason to believe, however, that its successful use was largely responsible for the satisfactory outcome of the work to date. With them the 8x8-ft. raise was successfully holed through to surface, and the same drills are now being used to strip the shaft to 12x14 ft. size from surface down. At present, this work has progressed about half the total distance.

It will be recalled that the Alpha shaft of the Giroux Consolidated, in Nevada, was opened by a raise 948 ft. long, thus exceeding in length that at the Rolling Mill mine. At the Giroux a light, stoper drill was also used with satisfactory results. In timbering and other details, however, the operations at the two mines were different. The method followed at the Rolling Mill mine, described by P. B. McDonald in this issue of the JOURNAL, will undoubtedly interest many operators, as an example of what can be done with a machine drill of light construction.

Mine Inspection

State mine inspection has never been efficient in the United States. It is not now, and there is only slender hope to believe that it will become efficient in the future. Municipal and state inefficiency is a chronic ailment in our domestic affairs. The federal government does better, wherefore eyes are more and more turned toward Washington. Secretary Root, in his impressive speech, called attention to this and pointed out that if centralization is to be avoided, the states must better attend to their own business. If they don't, Washington will.

On these lines, Dr. John Randolph Haynes, special commissioner on mining accidents, in the State of California, argues for a federal mining commission. He advocates:

> The etablishment, by congressional enactment, of a permanent commission of, say, five members, analogous in character to the Interstate Commercal Commission; this commission to have complete power to prescribe the conditions under which coal entering into interstate commerce shall be mined, just as the federal government at present passes upon the character and conditions under which meat products enter into interstate commerce. This commission should have power to appoint federal mining inspectors and to enact regulations for all coal entering into interstate commerce. The members, to be appointed by the President, should consist of three scientific men, selected for their special eminence in the subject of coal mining; one practical coal miner; and one business man of experience in the mining and marketing of coal. This commission should be empowered: First, to appoint its own inspectors; second, to pass and enforce regulations protecting the lives of the miners; and, third, to prevent the waste of coal in mining (now nearly one-half) for the benefit of future generations.

We suppose that such legislation under the cloak of the interstate commerce provision, which covers such a multitude of federal actions, would be constitutional, but to any sincere believer of state rights the idea must be abhorrent.

By the Way

In a contemporary we note that trouble was experienced with some foundations because "a worked-out coal mine existed practically over the whole site." Almost equal to Mark Twain's tunnel on the trestle.

The Pennsylvania courts, it appears, are to be asked to pass upon the sentimental—or other—value of a hole in the ground. The William Miles estate, which leases certain coal lands to the Pennsylvania Coal Co., has brought suit to enjoin that company from flushing the old workings at No. 1 shaft of the Old Forge colliery. The reasons given by William Repp, agent of the estate are: "By filling up the old workings they block our access to the mines to make measurements and ascertain by our engineers what amount of coal has been taken out. That's one reason. They have no right to fill up the space. Their rights consist in taking out the coal, not filling up the space. The hole in the ground is ours to do with as we please. If we had no other reason than a sentimental one to preserve our property interests in that hole in the ground, we should consider that sufficient to bring an action against the Pennsylvania Coal Co. to stop them."

Harris Merton Lyon describes in June *McClure's* the adventures of one Antonio Zachariah Podd, an "honest promoter" of the J. Rufus Wallingford type. A "practical miner" induced Podd to apply his genius to a copper showing in Canada. Kick Kaw Copper was accordingly organized; when the stock-selling campaign was only fairly under way, Podd received a telegram from the "mine," stating that the copper had pinched out, but that the showing now looked like silver. The prospectus writer was accordingly put at work on Singletree Silver, which was as great in proportion as the price of silver was to that of copper. But the silver showing went the way of the copper. The promoter wired the mine to learn what sort of a layer was underneath the silver and the reply read: "Looks like gold, but indications uncertain." Uncertainty at such a stage was merely a matter of temperament, however, and a lack of enthusiasm should not prevent the "progressive stockholders" in Kick Kaw Copper and Singletree Silver from having an opportunity to participate in a further exchange of shares, accompanied by a small amount of cash. The Gulliver Gold Mining Co. was accordingly organized. But Podd had guessed wrong again, for his "practical miner" stalked into the office one day and announced that they could not dig for anything any longer, as they had been drowned out by "fizz-water." Nothing easier in the world, however, for Antonio Z. A mineral-water company was formed to sell Vi-Joy, which did everything by way of restoring one to health, except operating for appendicitis. This is only fiction. We have read, however, of real pousse-café mines in Minnesota which are reported to contain layers of brick and pottery clay, gold and silver ore, iron ore, etc., the last representing any layers that may have been inadvertently omitted.

"In 1850, each person in the United States used 1028 lb. of coal and about 75 lb. of iron; in 1910, each person used 11,000 lb. of coal and 600 lb. of iron." In his recent commencement address on "Mining and Civilization," before the Missouri School of Mines, James R. Finlay reviewed the march of civilization as expressed today in our various industries, in our increased comforts, and in the ways of communication, such as railroads, automobiles, the great ocean steamships, and many other less striking phases of modern civilization. Continuing, he said: "I wish to draw your attention to the fact that practically all the means for these accomplishments are supplied by our mines. We dig out of the earth not only our materials but our energy. The modern ship is as good an example as any. She is wholly built of and propelled by the products of mines. The energy which makes possible the very process of building is supplied by mines, for almost every lathe is the world is driven by steam, which is furnished by coal. How shallow then is the idea so often entertained, and so casually expressed that the business of mining is a kind of gambling, from which the prudent businessman should carefully shy away! On the contrary, mining is the mainspring of our whole industrial system! This, I think, must be so plain to every thinking man, that I shall not dwell on it further."

It was the engineer-in-chief of a great modern undertaking requiring the combined efforts of civil, mechanical and electrical engineers, and of a big labor army with many officers graduated only in the school of experience, who expressed his desire for and belief in the ultimate supremacy of the college man as an executive. At the same time he frankly stated that where one college graduate had failed him for lack of technical attainments, nine had disappointed his expectations for other reasons. Some failed owing to inability to discipline themselves, and many others did not properly supervise, use and coöperate with those under their control. Some did not realize that the engineer is no longer any man who can merely subdue or adapt natural forces and materials to the needs of civilization. Not a few can now solve satisfactorily the purely mechanical side of problems; but the successful engineer is the man who, in addition to this, can make the dollar go farthest and draw out the best efforts of his workmen. There are, remarks John Calder, in the *General Electric Review*, several educational causes of failure which might be removed. The first of these is neglect of general culture prior to the college course. This is a marked defect in our present high-school system, and also in all the "get-wise-quick" schemes of a semi-scholastic nature for "framing up" an engineer. This neglect is followed too often—and even encouraged at some colleges—by options and by too early specifications, which frequently remove the last chance of the young engineer for an all-round mentality. No graduate should leave college in ignorance of the extent to which knowledge of the human factor bulks in executive success.

The "New American Rand" has again been discovered in Denver's backyard. An engineer "who has enjoyed an extended experience in Australia, South Africa, California and in the Nevada and Georgia gold camps," has reported that Newlin's Gulch has "the qualifications of one of the greatest camps ever discovered in the State of Colorado." However, a Colorado geologist, who has examined the "new Rand," is not so sure. In his "conclusions," he says that: "The only questions to be settled are the amount of the metal and the best methods of mining and extraction."

R. H. Titherington, in the New York *Sun*, presents the following rhyme of "The Get-Rich-Quick" man:

Dear friends, I venture to bespeak your serious attention;
I want you all to buy some shares in this unique invention.
You know how many millions have been reaped by Edison and Bell;
Friends, this new patent scheme of mine will pay at least as well!

Why buy those watered railroad stocks that Wall Street sharpers sell?
The Stock Exchange is nothing but a wicked gambling hell;
Now I'm a man of principle; I've nothing to conceal;
Trust me, dear friends; you'll always get the squarest kind of deal.

Next let me tell you of this tract of rich oil bearing land;
We've got fifteen producing wells—at least, we've got them planned.
To-day the stock's ten cents a share, but that price won't last long;
Next week 'twill rise; buy now and get a fortune for a song.

And then I have a wondrous mine, a glittering vein of gold;
To say there's billions in the thing would scarcely be too bold.
When once we get it opened up, its yield will be immense;
Invest a hundred dollars and you'll have a competence.

Why sell such stocks, you ask? Why don't I keep them for myself,
And rake in all the profits till I'm simply gorged with pelf?
Dear friends, I'm not that kind of man! I scorn such selfishness;
I want to give you all a chance to share in my success.

What's that I hear you say? An ugly rumor is abroad?
I'm charged with having used the mails for purposes of fraud?
This is a trick—an outrage! I decline to make reply!
I start at once for Canada—good-by, dear friends, good-by!

Competition in Aluminum Production

We have repeatedly pointed out the opportunity for competition in the production of aluminum in the United States since the expiration of the Bradley patents, leaving the metallurgical process free to everybody. While in Europe aluminum has been produced by a long list of rival concerns and the metal has become as free in the market as spelter, copper, tin and other competitive metals, in the United States the Aluminum Company of America has continued to exercise a monopoly, which has been tempered only by importations from Europe. It is especially interesting, therefore, to be able to report that there is soon to be competition by another American producer.

The Southern Aluminum Co., with a capital of $8,000,000, has been organized by L'Aluminium Francaise, in conjunction with some large French and Swiss banks, and the American Metal Co., Ltd., of New York. L'Aluminium Francaise is an amalgamation of the aluminum producers of France, including the works at Froges, Salandres and all the others in France.

The Southern Aluminum Co. has acquired, at Whitney, N. C., a water power which is partially developed. This water power has an estimated capacity of 50,000 hp., and the company is now engaged in completing the development for the purpose of making aluminum. The company is planning to erect an aluminum plant with a capacity of about 5000 tons of aluminum per annum.

The construction of this plant is to be under the direction of Dr. Paul Heroult, one of the leading metallurgists of this art, who is now on the ground executing the preliminary engineering work. It is expected that construction will be begun soon and that the production of aluminum will begin about 18 months hence. The company has entered into contracts for an ample supply of bauxite. While this new production of aluminum may mean the creation of a redundant output of aluminum at the beginning, we are of the opinion that the increasing consumption of this metal in the United States will soon take care of all that will be supplied.

Lucky Tiger Report

The net profit of the Tigre Mining Co. for the year ended Dec. 31, 1911, was $328,846, after deducting $88,675 for depreciation, according to the official report of the Lucky Tiger-Combination Gold Mining Co., the United States holding company for the Mexican corporation. The sum of $357,601 was paid as dividends.

Development work to the extent of 4099 ft. was done at the Sonora property; the ore exposed on three or more sides at the end of 1911 was 218,315 tons, averaging $19.20 per ton. The 46,945 tons mined and milled assayed $27.75 per ton, the total cost being $14.37 per ton. The total recovery is now being maintained at about 90 per cent.

The new 20-stamp mill, 250-ton cyanide plant and electric power plant were started July 1, 1911, and are being worked to full capacity. The old mill was in operation all the year.

Newlin's Gulch Gold District

DENVER CORRESPONDENCE

The stock in a company controlling property in the Newlin's Gulch district, near Denver, is being extensively advertised in a flamboyant fashion, and others will no doubt follow suit. From the standpoint of real mining the claims that are made are, of course, premature, to put it most kindly.

An engineer, who spent several days in the district, informs me that the placers are in the form of a horseshoe basin, surrounded by conglomerates to the height of about 100 ft., the strata of the latter being about as follows: On the surface about 1 ft. of trap rock, which covers a large area; then 6 ft. of coarse sandstone conglomerate, gold bearing; then about 1 ft. of greenish, clayey rock, described as disintegrated serpentine, barren of gold; then 1 to 2 ft. of sandstone conglomerate with large waterworn boulders. The gold in the conglomerates is not rounded and did not travel far. It is fairly coarse.

Powder Trust Dissolved

On June 13, 1912, the U. S. Supreme Court entered a final decree at Wilmington, Del., whereby three companies are to take the place of the one big powder combination which, in June, 1911, was declared by the same court to be in violation of the Sherman Anti-Trust Law. Under this decree the E. I. du Pont de Nemours Co. (1902, Delaware corporation), the Hazard Powder Co., the Delaware Securities Co., the Delaware Investment Co. and the Judson Dynamite & Powder Co. are dissolved and the property distributed among the stockholders, provision being made for the organization of two corporations in addition to the E. I. du Pont de Nemours Powder Co. (1903, New Jersey corporation). A fair proportion of the business controlled by the Dupont company must be distributed as far as practicable between the new companies. After Dec. 15, 1912, the companies will not be permitted to occupy the same offices, to have the same office force and organization or to have the same persons serve as officers or directors. If the conditions of the decree are not complied with by the above date, an injunction will be issued, restraining the defendants from placing their products in interstate commerce.

The petition concerning the International Smokeless Powder & Chemical Co. was dismissed because it was shown that this company is coöperating with the Government in a manner beneficial to the army and navy.

Iron Mines Assessments Lowered

NEGAUNEE CORRESPONDENCE

At a special session of the Michigan Tax Commission, held recently in Houghton, the assessments of two iron mines at Crystal Falls were lowered. The valuation of the Bristol mine, of Oglebay, Norton & Co., was reduced from $865,000 to $666,000, and the Great Western Extension, of Corrigan, McKinney & Co., was lowered from $50,000 to $18,000. In addition, credit was given the Bristol for ore mined, making a further reduction of $107,000. Doctor Leith, of the University of Wisconsin, the Tax Commission's iron expert, was present.

The reasons given for the reduction, amounting to about 25%, of the Bristol mine assessment, has to do with the figure for "expected average profit per ton" on Crystal Falls ore, which was given in J. R. Finlay's appraisal as $1.16, and which is rather high, especially in consideration of the prevailing low prices for iron ore. The Bristol mine ships two grades of ore, Bristol and Manganate. The former averages 54.86% iron and 0.633% P; the latter, 50.36% iron and 0.593% P. Both of these would be classed as rather low-grade ore, especially as before being dried the moisture content is 8 per cent.

The Great Western Extension figure was lowered because of the discrepancy in valuation between it and the assessment of the Neely exploration, to the east. The Great Western Extension, with less ore proven than the Neely property, had been assessed at a higher figure.

Using Boreholes in Shaft Sinking

In sinking a recent airshaft in the Kőnighutte district, Germany, a borehole was first put down to meet the workings below. At the surface the borehole was 79 cm. in diameter, and at 190 m. depth, where it met the underground workings, it was 53 cm. The ground removed in sinking was shot down this hole and then used as filling, says the *Mining Journal*, June 1, 1912, thereby saving about 20% in sinking cost, and fully 33% in the time required. The total cost of sinking, including the bore-hole tubing, lining the shaft with masonry, and expense of cleaning out the borehole once after it became blocked, was about 500 marks per meter.

Correspondence and Discussion

Views, Suggestions and Experiences of Readers

Fighting at the Cobre Mines

I send the JOURNAL a letter just received from our manager, Mr. Emerson, at El Cobre, near Santiago, Cuba.

BENJ. B. LAWRENCE,
President, Cuba Copper Co.

New York, June 18, 1912.

Dear Sir:

As you will have understood by my cables, the situation grew rapidly worse until we were attacked. I had guards out and men sleeping with their arms until the night of June 5. We had seen more and more men each night, and our sentinels were shooting every night and shots began to come in from outside, so on June 5, I put out every man I had a gun for, and a large force with dynamite. The insurgents had evidently gathered in considerable numbers and had planned a serious attack on the mine. Shooting started from outside at about 10 o'clock and we had to stop the Hardy hoist and put out all lights. One shot passed between the legs of the Hardy winchman. At 2 a.m. a concerted attack was made at Hardy, Mina Blanca, and by the stables. The insurgents began firing, and we used guns and dynamite and held them, except at the stables where they drove back our men on to my house, but retreated under cross-fire from Mina Blanca, the engineers' house and the house. We had no one wounded, but the shots hit the house in many places. It was pitch dark, and we do not know if we inflicted any damage or not, as it was easy for any wounded to get away.

The men had been up for many nights with constant shooting, and for a layman a few black nights with shooting is bad for the nerves, as I will testify. It became evident to me that we were not going to be able to stand very many more such nights, and I was very glad when Lieut. Belknap came over and told me I could have marines. Our actual request for marines I made to Lieut. Belknap at about 4 p.m. on June 6, and at about 7 p.m. they were landing in Punta Sal. Capt. Gulick in charge left a squad at Punta Sal and another at Hermitano bridge and then came on to Cobre. He has 108 men here now, and still keeps 12 of our armed Spaniards for duty at night.

Night before last a force of insurgents attacked Cuero, defended by 100 marines. They repulsed two attacks and sustained a fire from about 1 a.m. until daylight.

The situation does not improve. Hundreds of families have flocked into El Cobre, and we expect a famine and all kinds of such trouble. No supplies can come by road, and we are transporting everything over the railroad. Even the government made formal request for the mails over our lines as their roads were not safe. We paid yesterday under a strong American guard, and had no trouble. No one could be more vigilant than Capt. Gulick, and his men are on duty night and day.

E. H. EMERSON,
Manager.

Santiago, June 11, 1912.

The Mathematics of Copper Sampling

On reading the discussion on copper-bullion sampling, by D. M. Liddell and Dr. Edward Keller, in the JOURNAL of Dec. 16, 1911, and Apr. 6 and 13, 1912, it seems to me that there are points which require further explanation.

Thus: Mr. Liddell speaks of the difficulty of devising a template, so that the size-weight ratio of the corner-section holes shall be correct, as being insurmountable. It would be practically impossible, as Mr. Liddell says, to calculate a template for bars having a heavy bevel, such that the size-weight ratio of the corner holes would be correct for every individual bar. But sampling by the template system is based on the blessed law of averages, and it would not be impossible to calculate a template which would be correct for the average bars in any given lot. Thus bars in the same lot having a heavy bevel will not all be of the same thickness and, therefore, the top areas will be different, some will be slightly smaller than the template; nevertheless the average area will be nearly the same as that of the template. It is, therefore, possible to calculate an average position for the corner hole which, although it will not be correct for each bar, will be correct for the average. Such a result may be obtained by swinging the corner holes on the template inward from the normal position toward the center. Even if this is not an absolute solution it will closely approximate the truth.

THEORY CERTAINLY FAVORS SLABS

It seems to me that Doctor Keller's able paper is the strongest possible argument in favor of casting all crude argentiferous copper in the form of slabs. Many smelters recognize the superiority of this form and the larger part of crude argentiferous copper is now shipped in this shape. Unfortunately for the sampler, a number of smelters still cling to the old form of "pig," and a more irrational shape from the sampler's viewpoint would be difficult to devise. As Dr. Keller says, "a copper bar with a square cross-section or one approaching it, is composed of two edge zones of a slab symmetrically joined together; the most irrational form for the purpose of sampling by drilling." The ordinary copper pig has not a square cross-section, but one approaching a square—it would be quite impossible to sample such a shape by any one-hole method or even by a template containing a number of holes closely grouped in a given section. In such shapes we must perforce take cognizance of the bevel because, so far as segregation of the metal is concerned, the whole thing is bevel.

Sampling by sawing, in a large way, is practically impossible, although it may be done in an experimental way effectively. We must, therefore, rely on drilling by the template system as the only practical method for obtaining samples from pigs and other heavily beveled shapes of small cross-section.

It might be inferred from Doctor Keller's mathematical demonstration that it is not possible to take correctly representative samples from beveled shapes by drilling. This would, indeed, be impossible if the copper segregated in even layers, each differing in silver and gold contents from all the other layers. But, fortunately, this is not the case. Segregation occurs always toward or away from the cooling surfaces, not in mathematical lines, but in devious ways which are only regular on the whole, that is, which have a tendency in one direction but not an absolutely fixed progression in one direction. The metal in every parallelepiped is a mass of mixed crystals interfering with one another in all sorts of broken lines. Owing to slight differences in the surface measurements of pigs, a template can never be placed with mathematical precision, consequently the actual drill holes are sometimes in one section of a given parallelepiped, sometimes in another. The heterogeneity of the metal and the slight displacement of the drill holes save the situation, provided only that the sections of the parallelepipeds be small and the drill holes large. To insure accuracy, it is only necessary to drill enough holes in the whole, the half or the quarter of the pig. But care should be taken that those holes which are drilled in the actual bevel should be spaced so that the weight of borings taken from the

bevel bears a proper relation to the weight of borings taken from the body of the pig.

SURFACE ERRORS IN ONE-HOLE METHOD

Considering the one-hole method—if that name may be given to the scheme for boring slabs in a circumscribed area of the inner zone, to the exclusion of the wedge: It occurs to me that there might be a serious source of error with some kinds of copper. It sometimes happens that cakes exhibit a smooth top at the outside edges, covering an area an inch or an inch and a half wide. The inner portion of the surface, however, is very rough, containing many interstices and blow holes. The outside border consists of solid copper, while the inner portion is covered with an uneven crust of cuprous oxide. In this rough crust, particles of converter lining, matte, etc., are held, but they do not occur on the smooth solid metal constituting the border. The copper-oxide crust is usually much richer in silver than the solid metal beneath it. In boring such cakes by the restricted-template method, the tendency might be to get too much silver, due to the highlv argentiferous oxide crust, which does not occur, or at least is much thinner, on the outer border. On the other hand, matte or converter lining would cause a compensating error, but both errors would be at the expense of the copper contents of the sample.

It would appear that the one-hole or restricted template method would be applicable to anodes and all slabs which have a reasonably even surface, but in slabs such as I have described and in all thick bars with bevels, the older template methods would appear better. I hope this is not the case and that someone will prove it.

A. M. SMOOT.

New York, June 13, 1912.

What Is a Stratified Rock?

There is a question which the geologists might answer through the columns of the JOURNAL: What is a stratified rock? I am prompted to ask this question after reading some of the papers presented at the several geological societies in this country, by which I am led to understand that the distinction between stratified and eruptive rocks is not sharply drawn.

For example: Assume that a volcano is in eruption ejecting rock in the form of fine dust or "volcanic ash." This dust, being transported by the wind, falls into a lake, say at an altitude several thousand feet lower than the volcano; the dust settles to the bottom, and, the quantity being great, a thick bed of mud is formed. Assume that this mud consolidates rapidly into one coherent bed.

Assume that lower down in the crater of the same volcano, a mass of plastic rock is forced into an open fissure in the surrounding rock, which, solidifying, becomes a sill, say at a distance of a few hundred feet from the surface. After many ages, let us assume that this sill has been exposed on the surface by denudation and itself has been eroded, the fine débris having been carried by a river into the same lake as has been mentioned. Suppose that a fairly thick bed of this débris accumulates on the bed of the lake and ultimately consolidates into one coherent mass as did the wind-borne dust. Should that lake dry up and all the solidified sediments be exposed, would the geologists call the first an eruptive and the second a stratified rock?

C. C. S.

New York, June 12, 1912.

Reduction of Zinc Oxide

The articles of Prof. Harry C. Jones, which have been appearing in the ENGINEERING AND MINING JOURNAL, have been very instructive, and especially well adapted to give the average technologist or engineer new and valuable ideas on physical chemistry and its applications to industrial, chemical and metallurgical processes.

It is just because of the wide influence of those articles that I venture to criticize a statement made by Professor Jones, in the JOURNAL of June 1, p. 1087.

> "While zinc oxide is not reduced by carbon at 1100° C., it is apparently reduced at 1125° by carbon, showing that its energy of formation at this temperature is equal to that of carbon monoxide when formed from carbon and oxygen = 29,650 calories."

This statement gives an entirely erroneous idea of the nature of the reaction and of the heat relations involved. The reaction $ZnO + C = Zn + CO$, taking place at 1125°, is not a thermally balanced one, in which the heat of formation of the CO just equals the heat of decomposition of ZnO; on the contrary, the reaction at this temperature is *more* endothermic, that is, absorbs more heat, than it would if it took place at ordinary temperatures. It is not necessary here to explain in detail how the heat absorbed in this reaction at 1125° can be calculated (it is discussed in my "Metallurgical Calculations," Part I, p. 53), but suffice it to say that about 82,140 calories are absorbed at 1125° when this reaction of reduction takes place, and the supplying of just this large quantity of heat, at this high temperature, is the principal thermal work done in the zinc furnace.

Professor Jones' statement would leave one to infer that the chief thermal work of producing zinc consisted in heating the charge to 1125°, at which temperature the energy of oxidation of the carbon was equal to the work of deoxidizing the zinc; but this view is so far erroneous, as stated above, that it leaves out of the count the main work done in the reduction, viz., the supplying of the energy absorbed at this temperature.

A satisfactory viewpoint for this reaction, and one which I think Professor Jones will himself agree to, upon reflection, is that the immense amount of heat which is, undoubtedly, absorbed in the reduction in question, at 1125°, may be regarded as latent heat of reaction, quite analogous to absorption of latent heat of fusion or vaporization. We are all familiar with the boiling of water at 100° C.; the vaporization only takes place at 100° *in measure as* the latent heat of vaporization of the water is supplied from outside sources at the temperature 100°. In an exactly parallel way, heat ZnO + C to 1125° and the mixture is at the proper temperature to react; now supply the required heat energy from outside, at this temperature, and *in measure as* you supply it, the reaction takes place. The kernel of the whole matter is, that it is not sufficient merely to keep the mixture at 1125°, to have the reaction take place, but heat must be supplied, and in large amount, at 1125°, and the reaction then proceeds, at that temperature, in proportion to the amount of heat thus supplied. If anyone asks how the heat thus absorbed is supplied, the answer is: by trying to heat the mixture to a higher temperature, just as you boil water by trying to heat it to a higher temperature than 100 degrees.

My apology for this rather long protest is the great importance to the chemist and metallurgist of understanding rightly the *modus operandi* of reactions taking place at high temperatures with absorption of heat. Such reactions are numerous in chemistry and metallurgy, and if properly understood and comprehended can be handled and practiced much more intelligently.

JOSEPH W. RICHARDS.

South Bethlehem, Penn., June 15, 1912.

New Kink in Iodide Copper Assay

While I appreciate the practical utility of Messrs. Popper and Hall's contributions on the above subject (ENG. AND MIN. JOURN., May 25, 1912, June 15, 1912), are they not dismissing the theory too summarily.

Instead of unvarying reactions such as are indicated, especially by Mr. Hall's paper, I am under the impression that mass action, temperature, and concentration, all have a great effect, and that although the end product is chiefly cupric sulphide, I think it is not entirely so. As a matter of interest, it has been shown recently by Firth and Meyers, if the copper salt be in excess, a condition not compatible with quantitative work, metallic copper itself may be precipitated.

C. C.

Newark. N. J., June 17, 1912.

Mining on Forest Reserves

By Merritt Booth *

The National forests are open for prospecting and mining under the same regulations that apply to such operations outside the reserves. In Colorado, mining is being done on National forests; and the author maintains that legitimate prospecting is fostered by the Forest Service.

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"To be interested in faraway objects, like the moon," and to slight what is apparently within reach, is characteristic of human nature. During the last few years mining camps in distant countries have diverted attention from the great possibilities of the virgin mineral areas in Colorado. The fact that Colorado is an old mining state should not operate to drive the prospector and the money behind him to new and remote fields. The opportunities are as good at home as abroad, and in many cases a great deal better.

In boom times everything possible was said and done to increase the excitement and bring outside capital into the state; in fact, too much was said, and when reaction came people who had invested at random, without investigating the merits of the stocks offered for sale, found themselves in many instances

HYDRAULICKING NEAR HAHN'S PEAK, ROUTT NATIONAL FOREST, COLO.

LIMESTONE QUARRY IN A NATIONAL FOREST IN COLORADO

victims of an inflated stock market. The result was a general slump in mining which lasted for several years. Those who invested right have something to show for their money. Many of the prospects that were handled legitimately during the Cripple Creek excitement are now producing mines and have been for a number of years. The same can be said of Leadville, the San Juan region, and other camps of note throughout the state.

COLORADO WANTS NEW MINES

The old mines are holding their own, but the state wants new mines opened up; and prospecting is the first step toward effecting that end. During the recent period of inactivity in prospecting operations, new fields were talked of. Prospectors who could land a grubstake were off to Alaska, Mexico, Canada and other faraway places. The farther away the better the chances, so it seemed, and for a while Colorado was not thought of as offering inducements in the prospecting field.

Only recently have the people awakened to a full realization of the situation in Colorado and have started in anew to overcome the prejudices brought about by a long string of circumstances that naturally put a quietus on the prospecting business. Now, things appear to be on the move again. Through the efforts of the Denver Chamber of Commerce, the press, and enterprising citizens, prospecting has taken on new life, and it is probable that during the coming year many new finds will be reported within the state's virgin mineral areas. It is gratifying, to say the least, to observe the optimistic feeling that prevails throughout the state. The perfecting of processes to treat the extremely low-grade ores enters into the rejuvenation of mining, as a strong factor, and thousands of tons of gold ores that in years past were consigned to the dumps are now being handled at a profit.

NATIONAL FORESTS OPEN TO PROSPECTING

For a long time the fact that the greater portion of the mineral areas were within National forests caused considerable comment. The local mining people did not have a clear idea of what "Forest Service" meant and what the attitude of the Service was toward the prospector and the locating of mineral claims within the forests. Even at this late date people are met with who are not aware of the fact that the mineral areas within the forests are open to prospectors. The policy of the Forest Service is to encourage prospecting and the Service has no desire to antagonize the locating of valid mining claims, no matter how heavily timbered they may be; but the claim must be a valid one in order to pass to patent.

Under authority of the Federal laws, an examination is made of all mining claims for which patent is sought. No claims are protested unless they have been examined by practical mining men, men whose experience and association with the obstacles met with in mining, and with the prospectors and miners themselves, have rendered them capable of passing intelligently on the many intricate and unusual situations bearing upon the mineral possibilities of the areas staked out; and the claimant is given the benefit of the doubt, if any exists.

MUST COMPLY WITH MINING LAWS

The laws governing the locating of mining claims within and outside the National forests are precisely the same. The statutes provide that mining claims may be located only upon a discovery of valuable deposits, whether in lode or placer claims, and that no location of a lode claim shall be made until there has been a discovery of the vein or lode within the limits of the claim located. The object of the latter provision is evidently to prevent the appropriation of presumed mineral ground for speculative purposes to the exclusion of *bona fide* prospectors, before sufficient work has been done to

determine whether a vein or lode really exists.

The claimant, therefore, prior to locating his claim, unless the vein can be traced on the surface, must sink a shaft or run a tunnel or drift to a sufficient depth therein to discover and develop a mineral-bearing vein, lode, or crevice, and should determine if possible the general course of such vein in either direction from the point of discovery, by which direction he will be governed in marking the boundaries of his claim on the surface. The law also provides that five acres of nonmineral land noncontiguous to the lode may be patented when actually used for mining and milling purposes, and that patent shall not issue in any case until $500 worth of labor shall have been performed in the development of the particular claim located.

These are not rules invented by the Forest Service. They are the statutes of the United States. State and local regulations, so far as they do not conflict with the United States statutes, are recognized by these statutes and by the officers who enforce them. So the prospector is protected in the possession of his claim while he is working to discover valuable mineral thereon; but to preserve his possessory title, or, in other words, to protect himself against individuals who would jump his claim, he must comply with local mining regulations and do the annual assessment work required by law.

The enforcement of the United States mining laws with particular reference to the patenting of mining claims has eliminated the possibility of mining claims being located where there are no minerals, presumably for the purpose of obtaining title to large areas containing valuable timber, and of locating a number of claims around a new discovery merely to have additional territory. The law provides that a discovery of mineral must be made on each claim. In this the prospector is protected. He knows the mining laws were made for his benefit, and if large tracts of mineral and timber lands were allowed to pass in this way, there would be no ground left to prospect and no timber for the real miner to develop his mine with.

How the Forest Service Aids Prospectors

The Forest Service has placed no restrictions of any kind upon the prospector and locator of mineral claims; in fact, many have been aided in their search for the precious metals, through the advantages offered by the Forest Service. The efficient field force, with its carefully prepared maps and a general knowledge of local conditions, is available to the prospector for information as to the best routes and the accessibility of remote sections. By means of a developing system of telephone lines, constructed by the Service at considerable expense, these remote places are being brought into communication with the outside world.

A large amount of money is also expended in making trails over rough mountain passes which heretofore were inaccessible with pack outfits or even a saddle horse. These trails are a wonderful advantage and convenience in mountain travel. They obviate the necessity of making long detours in order to arrive at a point that is now reached by a short cut. The methods in practice for prevention and control of the much dreaded and destructive forest fires are being perfected in every detail. This in itself is something of more than ordinary value to the mining operator in heavily timbered sections.

The Forest Service has done more toward the advancement of mining than the public has given it credit for. All mineral lands are open to the prospector, and cases where adverse report has been made are few as compared with the number of claims that have been reported upon

Excavating for Thistledown Mill, Uncompahgre National Forest, Colorado

favorably. It is simply a matter of compliance with the United States mining laws on the part of the claimant, and, as it has become generally known that the Service is exacting nothing more, a change of feeling, I believe, has taken place from antagonism to a better realization of the benefits and protection accorded to the prospectors and miners whose fortunes lie within the National forests.

Round Mountain Mining Co.

During the year ended Mar. 31, 1912, the Round Mountain Mining Co., operating at Round Mountain, Nev., milled 54,915 tons, of a gross value of $7.09 per ton, recovered $6.24 per ton, had miscellaneous earnings of $0.08, and costs of $4.96, including depreciation of $0.31 and litigation charges of $0.20 per ton. The ore reserves were increased from 111,928 to 145,820 tons. Cash on hand increased from $60,658 to $115,491, and the company has no debts.

Litigation has been expensive during the year. The Commissioner of the Land Office rendered a decision in favor of the Round Mountain company in regard to the protest of the Sphinx company against the issuing of a patent to Great Western No. 1 claim, but the case has been appealed to the Secretary of the Interior. The company also has two other cases before the Supreme Court of the State of Nevada.

Developments in the mine continue to be encouraging, and placer work by the Round Mountain Power & Water Co. has shown a new 20-ft. vein running from $3 to $12 per ton which should be accessible from the 200-ft. level of the No. 2 shaft.

Oil Pipe Lines are Common Carriers

An order filed by the Interstate Commerce Commission on June 13 lays down the rule that interstate pipe lines are common carriers and are subject to the provisions of the Interstate Commerce Law. The Commission holds that the provisions of the law are clear, that the intent of Congress is plain, and that the validity of the sections affecting pipe lines has never been questioned before any court. It is therefore ordered that 13 of the larger pipe lines are to file by Sept. 1 schedules of rates and to comply otherwise with the provisions of the law. The companies affected are the Oklahoma Pipe Line Co., Prairie Oil & Gas Co., Standard Oil Co. of Louisiana, Ohio Oil Co., Standard Oil Co. of New Jersey, Tidewater Pipe Co., Ltd., Producers & Refiners' Oil Co., Ltd., United States Pipe Line Co., Pure Oil Co., Pure Oil Pipe Line Co., National Pipe Line Co., Uncle Sam Oil Co. and Uncle Sam Oil Co. of Kansas.

This decision was based on an investigation by the commission begun on its own initiative. The decision is in substance as follows:

The Decision

The act to regulate commerce impresses the obligations of a common carrier upon a pipe line engaged in the transportation of oil in interstate commerce, even though such pipe line was built over its privately acquired right of way, and transports only its own oil. Such traffic is not divested of its interstate character by placing the ownership of the pipe line in a different corporation in each state through which the transportation passes, and by transferring title to the oil to each of such corporations contemporaneously with the entrance of the oil into the pipes of that corporation at the state line.

The effect of a Kansas statute making pipe lines common carriers was not considered, as Federal jurisdiction depends upon Federal acts. If the Federal act is

ineffective, a similar statute of an individual state is of no avail.

The utilization by a pipe line of the right-of-way of a common carrier railroad does not impress upon that pipe line the obligations of a common carrier. A pipe line is not impressed with the obligations of a common carrier merely because, by arrangement with the abutting owner, it uses a public highway for right-of-way purposes.

The transportation by the New York Transit Co. in New Jersey and by the National Transit Co. in New Jersey and Maryland, prior to Nov. 1, 1905, was transportation by these corporations as common carriers.

The transfer by a common carrier pipe line to a private corporation of a portion of its property theretofore used in its common carrier operations, but not located in the state wherein it was incorporated as a common carrier, does not release that property from the obligations of a common carrier.

Stora Kopparbergs Bergslags Aktiebolag

The latest report of this Swedish company covers the year 1911. It is the oldest mining and metallurgical company in the world, its records dating back to the fourteenth century. Its present activities are varied, including mines of copper pyrites and iron; copper, iron and steel works; timber and paper-pulp works. For the year 1911, the income was $1,714,385; expenses, $841,665; net earnings, $872,720. The dividends paid were $666,665. Of the total profits, 16.1% were from copper; 20.2% from iron and steel; 22.1% from timber; 41.6% from pulp and paper. The production report for two years past is as follows, in metric tons:

	1910	1911	Changes
Pyrites mined.....	19,867	21,592	I. 1,725
Copper sulphate.....	320	326	I. 6
Sulphuric acid.....	3,685	6,159	I. 2,474
Iron and steel.....	66,946	67,311	I. 365

The company is actively interested in the use of the electric furnace. It is the owner of the Domnarfvets iron works, where the electrical production of pig iron was rather small during 1911, owing partly to the lack of water in consequence of the drought during the summer, and partly to many alterations to the furnace. The total working time amounted to 44 days and the operations, in fact, were conducted mainly with the view of experimenting and gaining experience. The results obtained are stated to have been very satisfactory. A new electrical furnace of a capacity of 12,000 hp., is now under construction and will probably be completed in October. The company is also having another electrical furnace built for the manufacture of ferromanganese and ferrosilicon, which will be completed in July.

Greene Consolidated

The report of the Greene Consolidated Copper Co., covering the operations of the Cananea Consolidated Copper Co., S. A., Cananea, Sonora, Mex., shows that the gross profit for the year ended Dec. 31, 1911, was $1,307,131, from which $280,180 was deducted for depreciation. The total production was as follows: Copper, 44,897,466 lb.; silver, 1,295,297 oz.; gold, 5892 oz. The production from its own ores was 37,101,119 lb. of copper, 795,160 oz. of silver and 3610 oz. of gold.

The average cost of the 51,874 ft. of development work accomplished was $8 per ft. The company mines produced 751,462 tons of ore at a cost of $2.46 per ton. The important developments of new ore have all been in the limestone areas. These ores are reported to contain from 3 to 5% copper, from 1 to 4 oz. of silver and from 10 to 30c. in gold per ton. They are direct smelting ores, highly basic in character. General Manager Ricketts states that the physical condition of the mines is good and that he looks for a satisfactory year ahead and a notable increase in the output of both copper and silver.

No attempt was made to press production during the year, but, on the contrary, the aim was to curtail. However, on account of the development of basic high-sulphur ores, more silica was needed; consequently operations were resumed at the Henrietta mine, which was closed in 1910, and the Cobre Grande mine was reopened. Toward the end of the year, work was also started at Puertecitos, with a view to increasing the output when necessary.

At Puertecitos, a new quarry for oxidized ore was started, and the porphyry contacts on each side of the limestone core of this hill are being developed. By the middle of the year it is expected that over 200 tons of smelting ore per day will be obtained from this mine. Dead work only was done in 1911, resulting in high costs at this mine.

The Henrietta mine proper, while profitable, is a small mine, and no large orebody has been found in its workings. This mine, however, is being used as a base for broader work in the development of this district.

The face of the Combination tunnel at the close of the year was 5200 ft. from the portal and is being slowly driven ahead. The tunnel has passed entirely beyond the Elisa zone and has entered the Cananea claim.

In the Elisa mine, the main oreshoot was opened on the sixth level, and was crosscut by extraction tunnels on the level of the Combination tunnel. The main shaft will be sunk during the coming year to develop the ore below. The ore was of satisfactory grade and the outlook is considered better than in several years past.

The limestone area of the Sierra de Cobre mine, over the Combination tunnel, has shown the most encouraging developments. Important orebodies were opened in the limestone adjacent to the Eureka fault at three points, and in a number of other places in the limestone ore was crosscut, which probably will yield important tonnages. The ore in this area is exceedingly irregular in its occurrence.

Developments on the tenth level of the Capote mine, under the old orebody, were disappointing, although some ore was encountered between the eighth and tenth levels. During the year ore was opened on the second, third, fourth and fifth levels, and it is believed that this ore will continue as far as the ninth level. A great deal of the ore is an exceedingly lean pyrite, which cannot be beneficiated at present, but noteworthy quantities of ore of profitable smelting grade occur on the lower levels. The mass of pyrite on the fifth level is about 220 ft. long, with a maximum width of 100 ft., and the indications are that a large tonnage of profitable ore can be obtained, even though no way of beneficiating the leaner material is available at present. A fairly large amount of this ore averages about 4% copper and some silver; so long as it contains at least 2½% copper, it should be profitable for smelting.

The Oversight mine maintained a steady production and a satisfactory amount of first-class smelting ore was opened. Development work is to be prosecuted vigorously during this year. The old Esperanza orebody is also to be opened. It contains a low-grade concentrating ore, which should be profitable under existing conditions.

The Vete Grande mine was idle in 1911, but operations will be resumed the latter part of this year. The Kirk mine produced 95,000 tons of ore, most of which was of smelting grade. The Cobre Grande mine produced a good quantity of ore for converter lining and for smelting. The old orebody is not adapted to concentration. A new body of concentrating ore was found to the west. It is of good grade, but apparently not of large extent.

The tendency is toward lower-grade mattes, and the company is endeavoring to develop ores low in sulphur, to help to raise the grade of the mattes. With this aim in view, the company bought a four-fifths interest in the Superior Bonanza mine, situated near Imuris, Sonora. This mine gives a siliceous ore containing small quantities of copper and larger quantities of gold.

The amount of money involved in the purchase of this mine is not large. It is probable that no ore will be produced until some time in 1913. Development work is being done and it is hoped that

before that time a sufficient tonnage of ore will be opened to justify building a railroad for the 5½ miles between the mine and the Sonora Railroad. The company has obtained a reasonable rate on this ore from the railway company, so that it can be brought to Cananea and smelted at a profit.

During the year, 528,412 wet tons of ore were milled. Of this, 415,199 wet tons were company ore; the concentration ratio was 2.40: 1. The total cost for concentration was 72.2c. per wet ton. An average of 77.69% of the copper in the ore was saved in concentrates. In the reduction works, 580,060 dry tons of new copper-bearing material were treated at a cost of $2.57 per ton. The total cost of mining and beneficiating, including every cost until the refined copper was sold, was $5.257 per ton of ore.

A Piece of Practical Forestry

By R. W. Raymond*

The greatest waste of our forests has always been, and continues to be, their destruction by fire. The U. S. Forestry Bureau has laid the blame upon the failure of Congress to make adequate appropriations; and leading members of Congress retort that they have striven in vain to have this department of forestry work more thoroughly covered, and that the Forestry Bureau had defeated such increased specific appropriations, while receiving immense sums for other and less vitally important operations. Whatever be the merits of this controversy, the fact remains, that conflagration annually destroys more than "conservation," in its widest and wildest aspect, can save.

Under these circumstances, it is a pleasure to note a piece of practical forestry, in a circular issued by the Pennsylvania Forestry Association, the Philadelphia Commercial Museum and Lehigh University, "for general circulation among the boys and girls of Pennsylvania." A million copies of this circular are to be distributed, with the aid and approval of the State Superintendent of Public Instruction, the State Commission of Forestry and the Governor of Pennsylvania, all of whom have affixed their signatures to the document, which will be placed in the hands of every boy or girl in the public schools of the state.

The circular, printed in red and black, with effective illustrations, is well calculated to make an impression upon youthful readers. The headings in red ink state such general propositions as: "We must have woods and forests, and those who follow us will need them more than we do!" "When fire runs through the woods, practically all the young trees are killed," "Forest fires are preventable." "What can you do to help?"— not to quote many other similar statements, each explained and enforced in subordinate black type—and the whole is summed up in the appeal. *"Therefore,* Never toss away burning matches, cigars, cigarettes or pipe ashes. Never start a fire in the woods among leaves, dry wood, or against a log, or against any tree, whether it be dead or alive. Never start a fire in the moss or peat of a dry bog—it may smolder for days, and at last break out in open flame. Never leave a fire until it is *surely out.* Never start to burn brush or stumps in a clearing in a dry time, or on a windy day, and never leave a fire burning in a clearing—stay with it until the fire is *completely* out. A locomotive which throws out sparks, or drops live coals along the track, may start a bad fire. Take the number of the locomotive which does these things, and send it to the division superintendent. He will probably thank you for the information."

This will suffice to indicate the character, though not the impressive typography, of the circular. The most noteworthy feature of it, however, is the effect which it has already produced among the boys and girls of Pennsylvania, who have taken up with enthusiasm the cause of forest protection, and who constitute already a vast corps of innumerable vigilant guardians and observers, more effective than any official body could be.

This simple yet powerful agency might well be invoked in other states.

*Secretary emeritus, A. I. M. E., 29 West Thirty-ninth St., New York.

Metal Schedule Hung Up

Washington Correspondence

The action of both House and Senate in declining to come to an agreement on the metal-schedule bill is regarded here as practically closing that subject for this session of Congress. During the week ended June 15, conferences were in progress for the purpose of securing if possible an adjustment of some kind that would permit something to be agreed upon between the two houses. On Monday, June 10, the House declined to accept the reciprocity and the print-paper amendments to the metal-schedule bill, inserted by the Senate, although it assented to the amendment relating to the ferro-alloys and pig iron. Subsequently the Senate formally refused to recede from its amendments and thus the measure is hung up.

There is an interesting situation with reference to this matter, however, as both sides freely admit that if the election in November goes in favor of the Democrats unreservedly, an adjustment will probably be arrived at that will result in sending the bill in some form to President Taft. Senate Republicans put in these amendments, in order if possible, to save President Taft the necessity of vetoing the measure. They will not feel it incumbent upon them to stick to this policy after the elections are over. Democrats will, it is expected, have little trouble in making concessions to the Senate Republicans that will result in putting through this metal-schedule bill if they desire to do so. The discussion has developed the fact that the opponents of the proposed reductions in iron, steel, lead zinc, and other metals have lost greatly in numbers.

International Smelting & Refining Report

According to the 1911 report of the International Smelting & Refining Co., the Tooele copper furnaces did not run at capacity at any time, because of insufficient ore supply, although matters were much better toward the end of the year. The lead furnaces were not blown in until Feb. 29, 1912.

At the Raritan Copper Works the capacity had to be increased by about 30%. The idea of building a lead plant at Perth Amboy was abandoned and work has been commenced at East Chicago, Indiana.

After allowing $175,229 for depreciation, profits were $1,219,037, out of which $800,000 in dividends were paid. Surplus now stands at $1,556,941 on a $10,000,000 capitalization.

Maryland and Pennsylvania Copper

The production of copper in Maryland and Pennsylvania for 1911 amounted to 665,110 lb. of copper, chiefly from the Cornwall mine, Lebanon County, Penn., says the U. S. Geological Survey. The mine is worked by an opencut, the ore going to a 1000-ton magnetic concentrator, where the iron is taken out, and the tailings concentrated for copper. The copper concentrates are briquetted by the Grőndal process.

The New London mine, Frederick County, Md., has an inclined shaft 300 ft. deep, and a 100-ton concentrating mill. It made a small production of concentrates during the year.

Alaska-Mexican

The 19th annual report of the Alaska-Mexican Gold Mining Co. covers the period from Dec. 16, 1910, to Dec. 31, 1911. In future, the fiscal year will conform to the calendar year. The net profit was $257,881, of which $126,000 was disbursed as dividends and $100,000 written off for depreciation.

Development work to the extent of 3613 ft. was done; the ore reserves are given as 980,025 tons, averaging $3.14 per ton. The amount of ore mined was 227,081 tons at a cost of $1.253 per ton. The stamp mill crushed 236,383 tons, at a cost of 27c. per ton. With heads averaging $3.26, an extraction of $2.97 per ton was obtained.

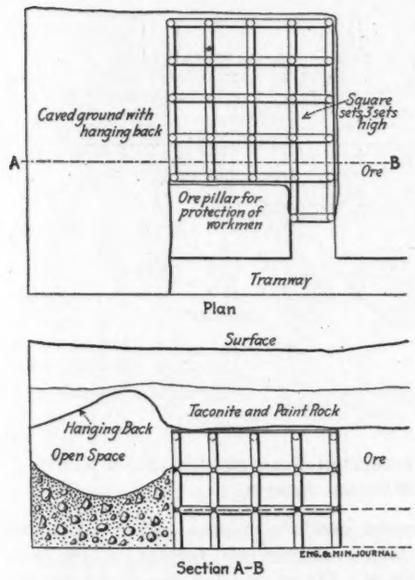
Details of Practical Mining

Accounts of Useful Ways of Doing Many Things in the Day's Work

Mining Dangerous Ground on the Mesabi Range*

BY B. M. CONCKLIN†

Some of the simplest and most useful practices in mining are occasionally overlooked for no other reason than their simplicity. It may, therefore, be interesting to note a method of mining practiced on the iron ranges of the Lake Superior region, which is simple in itself and also affords protection to the miners. In this case the ore is capped by tough taconite and paint rock, both of which



SYSTEM OF MINING ON MESABI RANGE

are more or less disintegrated, while the bottom of the orebody is solid taconite. The orebody is from 18 to 24 ft. thick. The square-set method is usually used in the extraction of this ore, the orebody being too thick to be adaptable to the slicing method operated from one level and too thin to develop more than one level.

In the extraction of ore at the start of operations the back refuses to cave entirely, but arches for considerable distances, making it extremely dangerous to the miners working along the semi-caved area. To protect the workmen and also to extend and weaken the arch which holds the ground from caving properly, square-setting is started two or three sets back from the semi-caved ground. The work is then carried on just as if a new pillar were to be worked out. The slice or drift is first driven the full width of the pillar; then square-setting is started toward the open room. When the room is reached, square-setting is carried on from the slice drift or crosscut to the open room until the tramway is reached, when the timbers supporting the square-set room are shot down and the ground allowed to cave.

This process is repeated until the ground caves satisfactorily, when the square-setting is again resumed, this time immediately along the caved ground. The accompanying sketches show the process.

There seems to be one serious objection to this method, the probable loss of ore in the last pillar between the square-set room and the tramway, due to the fact that the extension and resultant weakening of the arch has a tendency to crush this pillar as the timbers and pillar take weight. This disadvantage, and the additional cost of mining due to driving the crosscut through solid ore across the pillar, is offset by the greater protection afforded the miners.

*From the "Wisconsin Engineer," April, 1912.

†Mining engineer, Great Northern Ore Properties, Bovey, Minn.

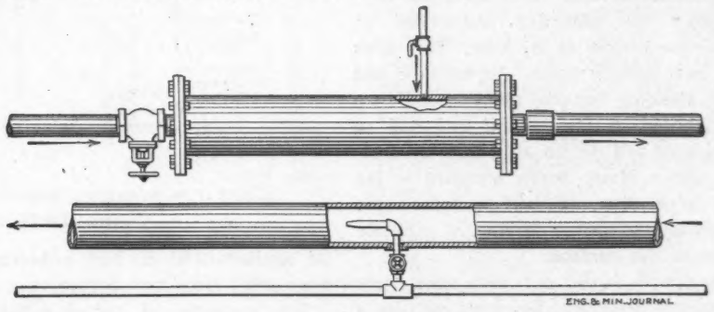
A Homemade Tuyere

To make a tuyere for forges take a piece of heavy gas pipe about 1½ in. diameter, long enough to reach from one side of the forge to the other, states the *Engineer and Fireman*. Enlarge one end so as to receive the point of the bellows well. Bring the other end even with the opposite side of the forge. Drill a 5/8-in. hole at the point where the fire is wanted. Imbed the whole tube at the usual depth in the forge, covering all parts, except fireplace, with brick or clay, or both, leaving a sufficient space for the fireplace. Insert a wooden plug at end of tube. After using for two or three weeks, some cinders will get in the tube; then remove the wooden plug, and using a rod with a small hook at the end, scrape it out clean. When good coal is used, such a tuyere will last for many years and stand heavy heats. The joints between bellows and tube are made air-tight with putty.

Water Blast for Allaying Dust

The James water blast, illustrated in the accompanying drawing, was developed in South Africa and now is used in many of the mines on the Rand. In a recent report by the Royal Commission on Mines of New Zealand, this type of dust allayer was recommended for adoption in the mines of that country. The blast is intended especially for allaying dust and absorbing noxious powder fumes immediately after blasting.

As shown in the figure the appliance is simple, consisting of a short piece of 6-in. pipe about 10 ft. long closed at each end by a flange which has been tapped and threaded so that the 6-in. pipe can be installed in any part of the 2-in. compressed-air mains. When placed in position the side of the 6-in. pipe is tapped and threaded for a small pipe by which connection is made with a supply of water under low pressure. This may be obtained conveniently by providing a tank or cistern for water storage in some part of the mine above the level in which the water blast is used.



WATER BLAST AND DRAFT INDUCER FOR ALLAYING DUST IN DRIFTS

A valve in the 2-in. service pipe and in the small water supply pipe are used to control the flow of air and water. While drilling is going on the air valve is left wide open, but the water valve is closed. When ready to blast the miners close the air valve and open the water valve; the 6-in. cylinder is quickly filled with wa-

ter. As soon as the blast has been fired the air valve is opened suddenly causing the water contained in the 6-in. pipe to be ejected into the face of the drift in the form of a fine spray.

The spray of water is effective for a distance of 30 or 40 ft. back from the face. To promote further ventilation an induction draft pipe as shown in the sketch may be used to deliver air at the face or to withdraw air from it. The water blast not only allays the dust made while blasting, but wets the broken material so thoroughly that little or no dust is raised by shoveling.

Correcting the Meandering of Boreholes*

By John I. Hoffmant

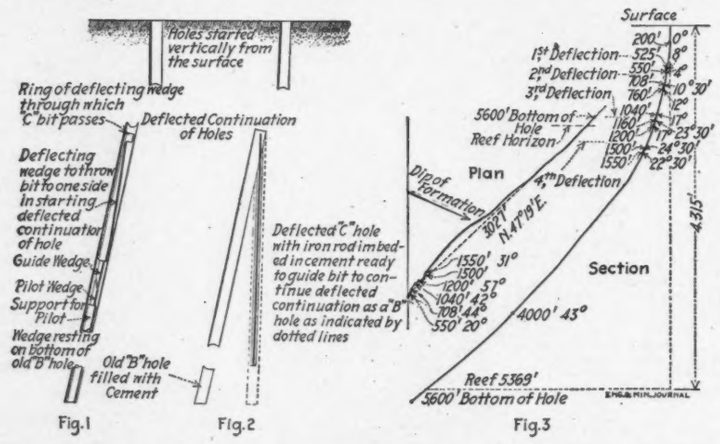
Another interesting application of the deflecting wedges described in the Journal of June 15, 1912, under the caption "Two Cores from One Borehole," is their use for cutting several cores from one hole or bringing back into line a hole that has meandered from the intended course. An example of such practice is afforded in the work done at the Lace Proprietary Mines' Vlakfontein borehole in South Africa. This hole was commenced in November, 1908, and was finished in November, 1909. In April, 1910, it was decided to try to obtain another core from the vein, commencing the deflection about 800 ft. above the bottom of the hole. This work was successfully done. As the hole had been standing for five months, sediment had settled in the bottom and had to be cleared out, which was done by drilling with a blank crown attached to the rods of a diamond drill to loosen the sediment, the pump forcing it with the water to the surface.

Then 150 ft. of old drill rods were dropped in the hole. The main rods were next lowered by the machine and it was found that the bottom of the old rods had stuck in the hole 10 ft. from the bottom. The main rods were then raised and 425 ft. of old rods were screwed together, on top of which 200 ft. of 1¼-in. black pipe was screwed and the whole length of 625 ft. dropped in the hole. The reason for screwing this pipe to the top of the old rods instead of using the whole 775 ft. of old rods was because the old drill rods were magnetic to a certain extent and would affect the needle of the survey instrument used, whereas it was found that the ordinary black pipe had no appreciable magnetism. To the top length of the 1¼-in. pipe a pilot wedge,[1] was attached. The position of this wedge was surveyed and the main guide wedge set so that the deflecting cut would be immediately opposite the direction in which the borehole was dipping. The position of the wedges then was as illustrated in Fig. 1. Drilling was then restarted with a "C" bit and rods 1⅝ in. diameter, the deflection from the old hole commencing at a depth of 5872 ft., was continued down to a depth of 6160 ft., where the foot wall of the vein was again cut.

From the above it will be seen what great advantage is gained by the use of a deflecting wedge, as in this case the second complete core of the vein was obtained at a distance of 60 ft. horizontally from the point where the vein was cut in the original borehole, for the cost of drilling only 288 ft., as against 6160 ft. had a second hole been sunk from the surface.

The necessity of reducing the diameter for the deflected portion of the hole has now been overcome by an ingenious process devised by William Gallagher, who for many years has been one of the leading diamond-drill contractors on the Rand. By Mr. Gallagher's invention a succession of deflections can be made in a borehole and each deflected portion kept the same diameter as the original hole. This was successfully done in the case of the Witpoort borehole, illustrated in Fig. 3, under my immediate supervision, where four successful deflections were made down to a depth of 1500 ft. in order to change the direction of the hole which had deviated from the vertical. The procedure is as follows:

When the deflecting wedge has been set, the "C" hole is only drilled to a depth of about 12 ft. below the top of the deflecting wedge, after which the rods are withdrawn and the taper tap is then lowered and screwed into the guide ring at the top of the main deflecting wedge which is pulled out of the hole, after doing which the pilot wedge, together with the bottom pipe connected to it, is also raised. A piece of round iron 1 in. in diameter and in this case about 13 ft. long, the bottom end of which has been bent about ¼ in. out of straight, is fastened to the end of the main rods with two copper rivets, and lowered down the hole until the bottom end of the round iron is level with the top of the new hole which has been drilled by the "C" bit. The rods are then lowered very gently and twisted round at the same time so as to bring the bent end of the round iron into the new hole. Once the operator thinks this has been done the rods are further lowered until the bottom end of the round iron rests on the bottom of the new hole. When this has been effected the copper rivets are sheared and the main rods withdrawn, leaving the iron rod at the bottom of the new hole.


Holes started vertically from the surface
Ring of deflecting wedge through which 'C' bit passes
Deflected Continuation of Holes
Deflecting wedge to throw bit to one side in starting deflected continuation of hole
Guide Wedge
Pilot Wedge
Support for Pilot
Wedge resting on bottom of old 'B' hole
Old 'B' hole filled with Cement
Fig.1
Fig.2
Surface
1st Deflection
2nd Deflection
3rd Deflection
5600' Bottom of Hole
Reef Horizon
Plan
Dip of Formation
4th Deflection
N.47°19' E.
Deflected 'C' hole with iron rod imbedded in cement ready to guide bit to continue deflected continuation as a 'B' hole as indicated by dotted lines
Section
4315'
4000' 45°
Reef 5369'
5600' Bottom of Hole
ENG. & MIN. JOURNAL
Fig.3

Ready for Starting Deflection, Deflection Started, and Plan Showing Deflections in Witpoort Borehole

A thoroughly liquid mixture of Portland cement is then made and put into a piece of pipe of a length sufficient to carry the required amount of cement to fill up both the old and new holes to about one foot above the top of the iron rod. The bottom end of the pipe is burred on the inside so as to hold a blank flange made of thin insertion the same diameter as the inside of the pipe. The pipe is then filled with liquid cement and a similar insertion flange fixed on the top, but having a flap valve cut in it. The pipe is then fastened to the end of the main rods and lowered in the hole until the bottom is one foot from the top of the iron rod. Water is then pumped down the center of the drill rod,

*Excerpt from a paper entitled "Recent Practice in Diamond Drilling and Borehole Surveying," Bull. 91, I. M. M. Figs. 1 and 2, accompanying the following excerpt, were not published in the article, but have been drawn from the description in the text.

†Mining engineer, 216 Moorgate Station Chambers, London, England.

[1]Described in Eng. and Min. Journ., June 1, 1912.

the pressure opening the insertion flap valve downward and forcing the cement together with the bottom insertion flange out of the pipe, and thus filling both old and new holes with cement up to the requisite height as shown in Fig. 2. This cement is allowed to harden for two or three days, after which, drilling with a "B" bit, the same size with which the original hole was drilled, is commenced, and the cement is drilled away until the top of the iron rod enters the hole in the bit and acts as a guide, pulling the bits and rods over from the old hole into the new. Drilling is continued below the bottom of the iron rod; when once the core breaks, the iron rod together with the core, which has broken off underneath it, is drawn out of the hole into the core barrel in the usual manner. Difficulty was experienced in drilling the Witpoort borehole, owing to the broken nature of the strata encountered.

While in the case of the Witpoort borehole the deflections were made to bring a deviated borehole around to the direction desired the same procedure can be followed to obtain a number of cores from a vein by deflecting in the direction of the vein at intervals along the lower part of the first borehole sunk.

Cleaning Air Compressor Cylinders

A method of cleaning air-compressor cylinders is described by A. P. Shaw, in *Power*, as follows:

A ½-in. hole is tapped in the suction line near the cylinder, into which a ½-in. pipe is screwed. From the ½-in. pipe a 2-in. vertical raiser, 18 in. long, is put in, the top closed by a screw cap; a globe valve is used on the ½-in. pipe. Once each week a cake of soap is dissolved in 2 gal. of hot water. When dissolved, the solution is poured into the raiser, a cupful at a time, through a screened funnel. When about three-fourths of the solution has been used, a half cup of oil is poured into the pipe, then it is washed out with the rest of the suds. Oil is then put in at the suction inlet to lubricate both the upper and lower parts of the cylinder, as when oiling with lubricators the oil does not reach to the bottom of the cylinders.

Skip and Dump Plate for Vertical Shaft

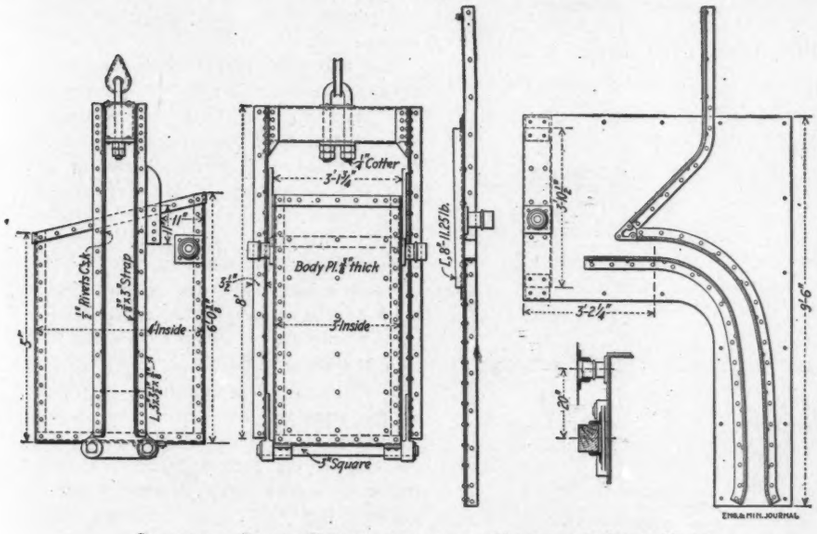
By Lee L. Wilcox*

A modification of the De Beer's type of skip for a vertical shaft, which is an improvement over the old type, is shown in the accompanying illustration. The top of the old type of De Beer's skip was square and trouble was experienced from ore falling back into the shaft. This not only gave the shaft an untidy appearance, but in a few instances the men working near the shaft were seriously injured by falling pieces of ore.

Attempts were made to improve the skip; in one instance a lip was riveted to the bottom plate; in another a filling piece was attached to the dump plate, thus throwing the lip up farther from the edge of the shaft. These changes proved to be only partially successful in stopping the ore from falling back down the shaft, but they introduced other faults which were nearly as bad. The lip would spread the discharge of ore so that it would lie on the dump angles, causing the skip to stick as it descended; and the filling piece decreased the inclination of the skip when dumped so that it did not clear itself readily.

When the new Pettit headframe was built it was decided to make some changes in the design of the skip. It was made longer in proportion to the base than is customary; the dimensions being, base 3x4 ft. and length 6 ft. on one side and 5 ft. on the other. The base dimensions are unusual, because of local conditions. Under ordinary conditions it would have been made nearly square. The additional length, however, throws the lip considerably farther away from the shaft and all the ore is discharged well back from the edge of the shaft. By incorporating the extended lip in the body of the skip itself, as shown in the illustration, the trouble caused by the ore gathering on the dump plates was entirely overcome. The new skip was satisfactory from the start.

A few changes were made in the dump plates which are worthy of mention. The dump angles were shod with a ⅜-in. strap; as this strap is worn it can readily be replaced without removing the dump angle itself, thus making the repairs much easier and simpler. The plate was reinforced behind the dump roller by a channel. This prevented the bending of the plate at this point which on the larger skips is troublesome.



SKIP AND DUMP PLATE USED IN A MINNESOTA IRON MINE

Concrete Stations in Shafts*

Concrete plats or stations, have been in use at both the Ahmeek and the Mohawk mines in the Lake Superior copper country for some time. They differ from the timber station in outward design only in the cross-section of the members, which are 9x12 in., and are reinforced with old rails and wire rope and replaced the 12x12-in. and 14x14-in. timbers formerly used. Holes are cored to accommodate gates for skip and dump doors and tram rails are imbedded in the concrete, making the use of spikes unnecessary. When turntables are used at the back of the stations, the rigidness furnished by the concrete insures the trammers against derailment of cars resulting from a tilted table.

At the present time, the Ahmeek company is installing reinforced concrete dividings to replace the practice of putting in 10-in. flat timber. In cross-section they are 9x12 in., and are reinforced by old rails. On the ladder road, they are placed six feet from center to center and between the skip compartments are put in as often as the hanging requires. Since the casing along the ladder road performs no other function than the protection of the men while on the ladder, or in case of a fall, plank is used for the purpose and a 3-in. hemlock strip is molded into the dividings to facilitate the fastening of this casing.

*Chief Engineer, Republic Iron & Steel Co., Gilbert, Minn.

*Excerpt from a paper entitled "Reinforced Concrete as Applied to Mine Shafts," read by E. R. Jones before the Michigan College of Mines Club, Houghton, Mich., Feb. 25, 1912.

Details of Metallurgical Practice

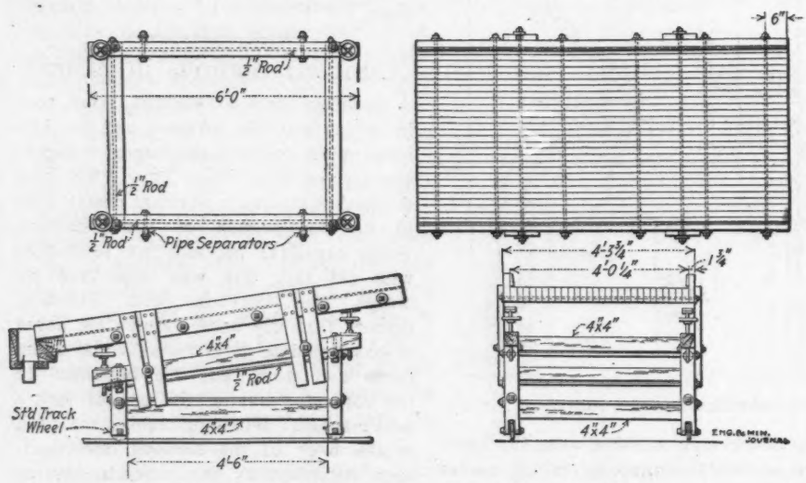
Records of Experience in Ore Dressing, Cyaniding and Smelting

Adjustable Amalgamation Table

The amalgamation table shown in the accompanying illustration differs from those that have been described heretofore in these columns in that it is made in two parts, a table or platform for the copper plate, and a truck with wheels upon which the table proper is adjustably mounted. This construction is particularly desirable when the table is to be used directly in front of tube, chilean, Huntington mills, or grinding pans, as the plate table may be lowered to clear the discharge lip of these machines and the entire structure be moved forward on the tracks so as to make the front of the mill accessible while repairs are being made; the grade adjustment permits drawing the head end of the table tightly up under the discharge lip of the crushing machine and setting the table at any desired slope. Not the least important advantage of a movable table is that it may be so placed that no grease or oil will fall upon it while overhauling of the mill is in progress. These advantages also appertain to the use of the table in front of stamps, although perhaps not to the same degree as when it follows other crushers.

The plate table is strongly made of a number of longitudinal 1¾x4-in. battens running the entire length of the table and held tightly together by tie-rods that also hold the 1¾x8-in. sides in place. The single copper plate is bound to the upper surface of the table by a cleat on each side. The plate table is supported upon the truck frame as is clearly shown in the illustration. The adjustment of the slope is made by manipulation of the four hand-wheel screws on the truck.

Tables of this type made by the Allis-Chalmers Co., were installed in a mill in Eastern Nicaragua. The plate table proper may be supported upon stationary framing as in the more common practice.



AN ADJUSTABLE AND MOVABLE AMALGAMATION TABLE

Strength of Crane Chains

In the accompanying table the safe working load for crane chains is given with 4 as a factor of safety; in some cases a factor of safety of 6 is used.

Diameter of link, in.	Safe working load, lb.
¼	840
⅜	1,260
½	1,820
⅝	2,520
¾	3,360
⅞	5,180
1	13,440
1¼	21,000
1½	30,240

Chains, according to *The Foundry*, should be examined frequently, and occasionally annealed to prevent crystallization. As the links wear, the strength of the chain is correspondingly reduced.

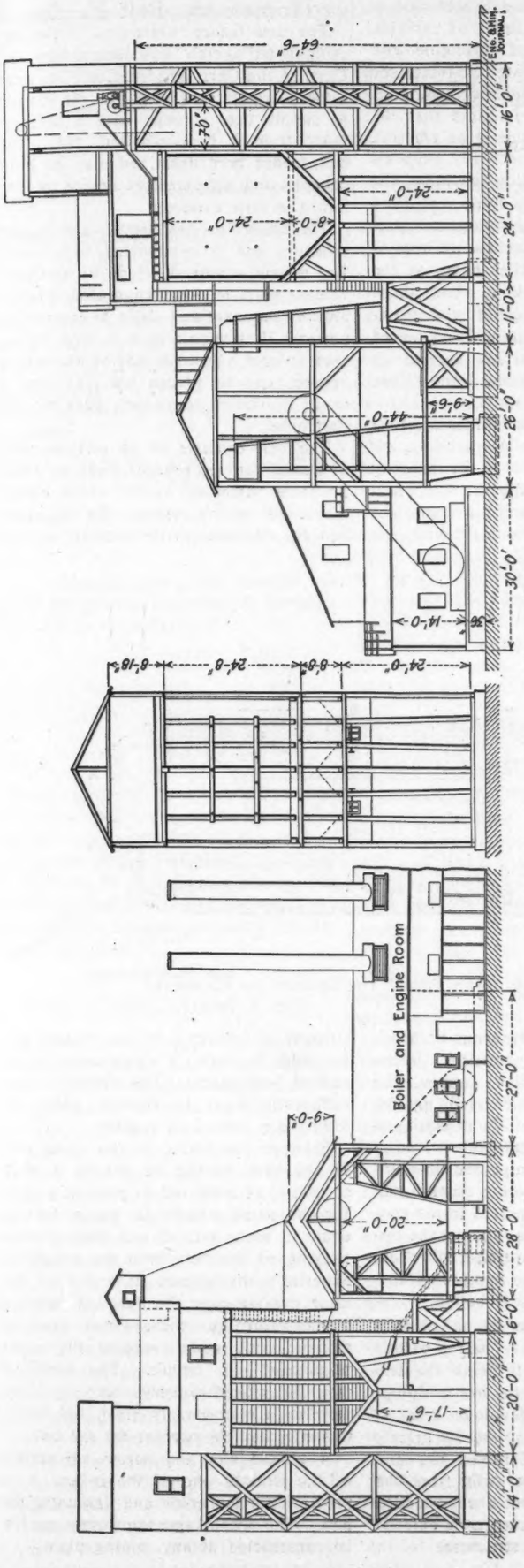
At the Benoni mill in the Transvaal, slime treatment in Way-Arbuckle cones has been discontinued, but the sand-treatment process seems to be satisfactory.

Joplin Ore Bin Construction

In the Joplin type of surface plant, the mill is built close to the mine bin at the collar of the main shaft. This makes a compact type of plant with the ore from the bucket going directly to the jaws of the crusher without rehandling. Until within the last few years, during which time the Freeman type of one-reduction electric hoist was perfected, the quantity of ore that could be handled through one of the shafts with one hoist was limited to about 250 tons in eight hours. Now it is possible to hoist twice as much with one engine of the improved steam or the Freeman electric type.

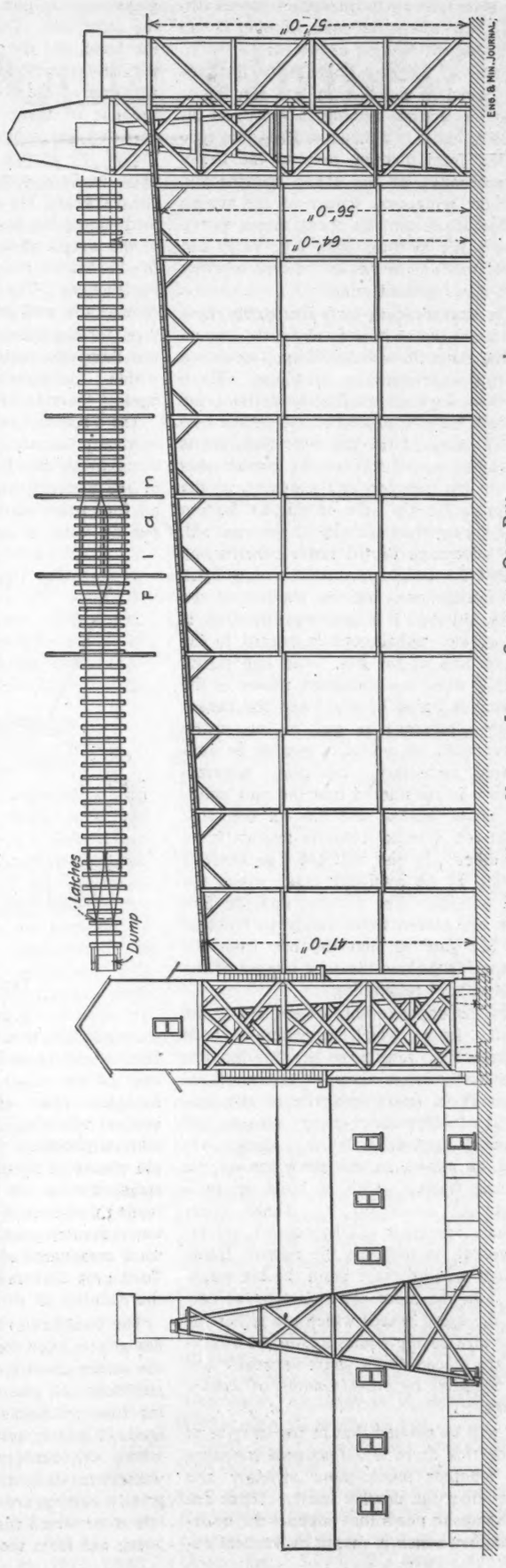
The shafts are rarely more than 200 ft. deep and usually are 5x7 ft. in section. The tramming was, until the last two or three years, done by hand and no mules were used or other forms of traction like endless rope haulage or gasoline locomotives which are now to be tested in the district. It was, therefore, cheaper to sink another shaft when it was desirable to send a larger tonnage to the mill so as to enable running it two shifts, and to transfer the ore by a skip car, rather than tram it underground by hand.

The bins at these auxiliary shafts are of the ordinary type with the bottom sloping in one direction and are built at the side of the derrick frame. A headframe is known as a derrick frame at Joplin. But in a few instances where the auxiliary shaft is quite close to the mill shaft, the ore instead of being culled and broken down on a grizzly at the auxiliary shaft and sent to a bin then to be transferred in a car, is dumped directly into a car and lowered by gravity down an incline trestle to the mill grizzly where it undergoes the ordinary treatment. This requires a higher auxiliary derrick and an expensive trestle so that it is more usual to use a bin with a grizzly over it and cull down the ore in the ordinary manner, then draw it from the bin into a skip car and take it up a short incline trestle near the mill, much of the track when the shafts are 300 ft. apart being on the ground. The auxiliary hoist serving this transfer car is sometimes placed in the mill-shaft derrick. Sometimes when a small amount of transferring is to be done it is placed on the ground where the engineer tending the mill engine can do the transferring of the ore if the work at the main shaft keeps the hoistman busy all the time. When both shafts are hoisting at capacity the engine serving



FRONT OF ORE BIN AND ELEVATION OF P. L. & M. MILL

AVE MARIA MILL AND ORE BIN



WEST ELEVATION OF AVE MARIA MILL AT JOPLIN, SHOWING ORE BIN

the transfer skip is placed at the auxiliary shaft where the man running it can also tend the loading of the car.

Some of the mill hoppers, as the bins are called in the district, are also made with the bottom sloping in only one direction, but it is difficult to keep this type of bin from pushing over to the heavy side because of the cheap construction that the temporary nature of the mining makes necessary, as these mines rarely have a life of more than four years and often only one or two in the case of other than sheet-ground mines.

On that account it is becoming more and more the custom to make the bottom of the bin with a double slope, as shown in the accompanying drawings. There are two ways of bracing the bottom; the cap sill may be placed on top of the bottom pinning of the bin with short struts extending up to support the bottom sills of the bin between end supports, or the supports for the sills of the bin bottom may spring from the cap of the mud sill. The advantage of the latter construction is that the weight is thrown evenly upon the foundations, for the loading of the posts, although it is somewhat unequal, is not greatly unbalanced in regard to the center line of the bin. The importance of this, when the temporary nature of the mining is borne in mind and the consequent reluctance to put in as costly foundations as would otherwise be considered necessary, becomes apparent when it is considered that the mill building abuts against the bin on one side while the derrick frame is against it on the other. In the mill the line shaft is carried by an auxiliary truss where the mill is wide. The crusher and the first rolls are placed immediately in front of the bin gate so that the ore from the crusher drops into the feed hopper of the rolls without rehandling.

On the opposite side of the bin is the derrick frame which is generally built square. The four posts are 8x8-in. timbers with 8x8-in. cross timbers placed about 20 ft. apart vertically to give stability. Intermediate cross braces and diagonal braces of 2x8-in. planks are used as shown in the drawings of the derrick frame, which is built up to a height of about 60 ft. These intermediate braces, it will be noticed, are arranged so as to brace the derrick frame against side pressure from the bin structure. In the more common type of derrick the cross braces which are either the same size as the posts, 8x8-in. or 10x10-in., are placed 15 ft. apart vertically and tied together by cross timbers of 2x8-in. planks.

It will be noticed that in the interior of the derrick there is a four-post structure tied together much more strongly and better than the derrick itself. These are the Sampson posts that support the hoisting engine, which is driven by vertical engines so as to give little side vibration to the structure. This manner of carrying the hoist and the use of an engine with vertical reciprocation are characteristic features of the Joplin derrick, and it is because of these two features that the derrick type of headframe is so efficient. Indeed the derrick frame really supports only the floor surrounding the hoist, the sheave wheel, the tail or dump rope used in dumping the hoisting bucket, and part of the weight of the grizzlies, the rest of the burden of the grizzlies being on the bin timbers. The resultant of all these forces falls well within the derrick structure, for the hoisting engine is on top of the Sampson posts that are carried up within the derrick frame and close against the side of the shaft.

The Sampson posts sometimes are four vertical posts, as shown in one of the accompanying drawings, but in the majority of the derricks, especially the low ones, all four posts of the Sampson frame are put up with a considerable batter, as shown in all the other drawings of headframes accompanying this article. In the case of the lower derrick frames, the Sampson posts are reinforced against vertical vibration by four bolts equipped with turnbuckles. In the higher frames old pieces of hoisting rope are used instead of bolts. In still other cases a box loaded with rock is suspended in the center of the Sampson posts to resist the upward component of the vertical vibration. To the top timbers of the Sampson frame the bedplate of the hoist is bolted.

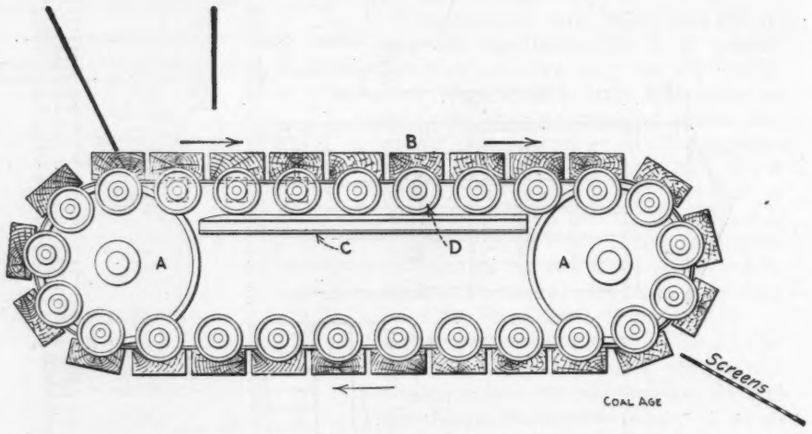
The boulders of waste are culled on a flat grizzly over the bin. The top of this bin comes about 4 or 5 ft. below the derrick floor and generally the ore in dumping from the bucket slides down a set of inclined grizzly bars on to the flat grizzly where the boulders of mixed ore and waste are sledged. The culls from the grizzly sorting are almost always loaded into a car which runs on a trestle extending out from the bin structure.

Homemade Belt Feeder

The belt feeder illustrated in the accompanying sketch was designed by Mr. Carr, of the Carr Wood & Coal Co., near Lytle, Texas, states *Coal Age*. It is used to supply coal screens with a uniform feed, from a hopper-bottom bin. The belt feeder here described may be built cheaply and an excellent device be obtained at little expense.

The apparatus has proved wholly satisfactory and is constructed as follows: The drums *A* may be made of any convenient material, and connected, preferably by sprocket and chain to the motive power. They should be 3 ft. long, or extend at least 3 in. each side of the hopper bottom, and be placed not less than 4 or 5 ft. center to center, parallel and horizontal.

The belt consists of an endless strip of heavy canvas, brattice cloth or other available material, whose width equals the length of the rollers. To this cloth belt are attached, on the outside, wooden strips *B*, 2x4 in. by 3 ft. long, placed side by side to form a continuous circuit around both drums. The whole is made sufficiently tight to revolve when the drums are placed in motion.



TRAVELING BAND FEEDER FOR SCREENS OR CRUSHERS

Between the drums, on the upper path of the belt, should be placed a short section *C* of mine rail to provide a track for the small wheels *D*, placed on the ends of each strip *B* and thus prevent sagging of the belt from the weight of material in the hopper. It is obvious that after passing over the forward roller *A* on the return run these wheels need no support until again reaching the upper portion of the circuit. The strips *B* may be placed loosely, side by side, forming a transversely rigid, but longitudinally flexible support for the belt.

A simple slot and screw adjustment of the axle of one of the rollers *A*, is provided for loosening and tightening the belt. The whole apparatus may readily be constructed at any mining plant.

The Cost of Doing Things

Data from Mining and Metallurgical Practice

Hand Sorting and Developing at the Ferreira Deep

At the Ferreira Deep Ltd., Transvaal, South Africa, all ore is hand sorted before it is sent to the mill, the discarded ore averaging about 0.7 dwt. fine gold. The following is a record of the amount of ore discarded by sorting for the last six years:

1906	17.40%	1909	10.60%
1907	18.14%	1910	19.95%
1908	12.56%	1911	19.70%

Average discarded for the last six years is 16.3% of the ore sent from the mine.

The following gives the number of tons of ore produced per foot of development work in the mine:

	Unsorted Ore, Tons	Sorted Ore, Tons
1906	30.8	25.5
1907	45.4	37.2
1908	40.7	35.6
1909	46.0	41.2
1910	64.0	51.2
1911	43.0	34.4
Average	41.3	36.6

Based upon the total tons mined and the additions to ore reserves 64 tons of unsorted ore are developed per foot of development work; allowing 16.3% of the additions to ore reserve, for ore that will be discarded by hand sorting, gives approximately 53 tons of sorted ore developed per foot.

Mass Consolidated Costs

The 1908 annual report of the Mass Consolidated Copper Co. in the Lake Superior district, Michigan, states that the average number of machine drills operated during the year was 11.04, that 200,808 tons of rock were broken, and that 175 men were employed. This gives an average of 18,188 tons per year per drill and 1147 annual tons per man employed. This is practically 67% increase in drill efficiency and 22.7% increase in tons per man over 1907, when 309,132 tons of rock were broken with an average of 28.3 drills and 330 men; or an average of about 10,900 annual tons per drill and 935 tons per man per year. The increased efficiency in 1908 over 1907 was credited by the management to the increased efficiency of the men employed. Based upon the tons of rock stamped the total expense has averaged: $2.05 per ton in 1907; $1.68 in 1908; $2.07 in 1909; $2.60 in 1910 and $6.33 per ton in 1911. The increase in the costs in 1911 is due to an excessive amount of construction and development as well as a reduction in tons stamped. "C" shaft was sunk 152 ft. during the year for $222 per ft., 6410 ft. of drifting was performed at $5.75 per ft. and 466 ft. of crosscutting at about $4.40 per ft. These costs do not include any proportion of surface expenses. Based upon the total tons of rock hoisted, development expense amounted to 49c. per ton; mining, 88c.; surface, rockhouse and office expense, 34.4c. per ton and stamping 47.4c. per ton stamped. In addition to these charges other expenses such as construction, treatment and selling charges, etc., bring the cost per ton stamped to $6.33 as stated. Owing to the low yield of the ore, which averaged only 11.3 lb. from 1906-1910 inclusive, the cost per pound of copper has been 18.3c. The yield per ton stamped in 1911 was 17.58 lb. per ton and the operating charges apparently about $3.45 including development.

Ivanhoe Costs

At the Ivanhoe Gold Corporation, Ltd., property, Boulder, W. A., the total cost of producing 238,965 tons (2240 lb.) of ore was $5.13 per ton, which included $2.02 for mining; $2.01 for ore treatment; 33c. for general expenses; 10c. for charges on bullion; 58c. for mine development; and 9c. for improvement to buildings, mine plant, machinery and equipment. Of the ore-extraction cost, $1.29 per ton was charged for breaking ore; 25c. for filling stopes and 48c. for trucking and raising ore to surface. The ore-treatment expense was made up as follows: Rock breaking, 8c.; transportation to mill, 3c.; milling, 41c.; concentration, 15c.; roasting, 12c.; fine grinding of concentrates, 3c.; fine grinding of sands, 16c.; cyaniding of concentrates, 3c.; leaching of sands, 18c.; agitation of slimes and treatment, 39c.; filter pressing, 14c.; precipitation and smelting, 9c.; and disposal of residues 12c. per ton milled.

The net yield in gold was 113,691 fine ounces, or an average of 0.474 oz. of gold and 0.094 oz. of silver per ton of ore. The total extraction at the mill was 88.61%, of which 25.75% was obtained by amalgamation; 12.60% by leaching; 30.37% by agitation and 19.89% by concentration. An average of 6.92 tons was crushed per stamp per day. At the end of 1907, the ore reserves were reported as 926,737 tons (2000 lb.), and at Dec. 31, 1911, 1,088,421 tons, making an increase of 161,684 tons; during this period, 930,768 tons were mined and treated and 21,335 ft. of development work performed, which would indicate that about 51 tons of ore were secured per foot of development work. During 1908, the total power cost was 38c. per hp. per day, made up as follows: Labor and salaries, 6c.; fuel, 22c.; water, 5c.; oil, grease and waste, 1.4c.; and repairs and maintenance, 3.6c. per hp. From 1908 to 1911, inclusive, expenditures on buildings and equipment averaged 18.3c. per ton of ore produced. Reference to a schedule of these expenditures, since the beginning of operations, shows that this is about the average charge required to meet the necessary charges of this nature.

Pig Iron in 1909

According to the 13th census of the United States there were 208 iron and steel blast-furnace establishments in 1909, comprising 388 stacks of which 370 were active; 195 were operated by corporations producing 98.7% of the total production as compared with 97.7% in 1904. In 1909, 86% of the establishments reported products valued at over $1,000,000 against 49 in 1904 and the production of these concerns amounted to 85.8% of the total production, an increase of 11% over 1904. Of the total cost of production as reported 1.8% was for salaries, 6.8% for wages, 88.4% for materials and 3% for miscellaneous expenses. The total horsepower used in connection with blast-furnace operations amounted to 1,173,422 of which 198,040 hp. were generated by 85 gas engines operated by blast-furnace gas. A total of 43,061 men was engaged in the industry; 48 were proprietors and firm members, 262 salaried officers of corporations, 809 superintendents and managers, 3513 clerks, and 38,429 wage earners. Of the total: Firm members, officials, managers and superintendents amounted to 2.6%; clerks 8.2%; and wage earners 89.2% of whom 99.8% were males, less than 0.1% females, and 0.2% under 16 years of age.

Total pig-iron production was 25.651,798 tons (2240 lb.), consisting of approximately 10,000,000 tons of bessemer pig ranging from 0.04 to 0.10% in phosphorus, and 250,000 tons below 0.04%; basic pig, 7,750,000 tons; foundry

5,550,000 tons and the remainder in miscellaneous castings, alloys, etc. About 62% of the total production was consumed in the works of the various companies in manufacturing steel and iron products and 38% sold as pig iron. In the production of this tonnage, 48,353,077 tons of iron ore at an average cost of $3.88 per ton were consumed; 96.5% of which was domestic ore costing $3.80 per ton and 35% foreign ore at $5.54 per ton. Other iron-bearing material consisting of mill cinder, scraps, etc., to the amount of 1,982,530 tons and costing about $2.79 per ton was also used, making a total of 50,336,207 tons of iron-bearing material treated. Flux used amounted to 13,570,845 tons at an average cost of 90c. per ton. Heretofore the fuel consumption reported included fuel for steam raising but for 1909 the following figures represent only fuel consumed in smelting: Coke, 28,068,335 tons @ $3.64 per ton; charcoal, 38,032,618 bu. @ 7.4c. per bu.; anthracite coal, 265,401 tons @ $3.41 per ton; and 102,833 tons of bituminous coal @ $1.64 per ton. All other materials used in the process of producing pig-iron amounted to about 20c. per ton.

SUMMARY

The figures reported in the census are not intended to furnish the total cost of manufacture so that the exact profits may be determined but the following interesting facts may be deduced from the figures stated: Based upon the total men engaged in the iron and steel furnace industry, 595 tons of pig iron are produced per year per man; 610 tons per clerk and wage earner employed or 667 tons per year per wage earner. Based upon the tons of iron-bearing material treated, approximately 1310 tons are treated per year for every wage earner employed, and including tons of iron-bearing material, flux and fuel handled in smelting, about 2400 tons are handled per year per wage earner. Of materials used apparently it required 1.89 tons of iron-bearing material to produce one ton of pig iron, 96% of which was iron ore; and 0.37 tons of flux per ton of iron ore, cinder, scraps, etc., treated. The amount of fuel of course varied according to the nature of the fuel used but by using the figures as reported they would indicate that it required 0.43 tons of coke, 0.585 bu. of charcoal, 0.004 tons of anthracite and 0.0015 tons of bituminous coal to smelt one ton of material consisting of ore and flux in the ratio stated.

At the Greene Consolidated, in Sonora, Mexico, it was estimated that three barrels of oil as furnished them by the Texas Oil Co. was equivalent to one ton of run of mine coal.

Minas del Tajo Milling Costs

The following costs were extracted from a paper by George A. Tweedy and Roger L. Beals, published in Vol. XLI, *Trans.*, A. I. M. E. The Minas del Tajo is in Rosario, Sinaloa, Mexico, and treats approximately 70,000 tons per year by cyanidation.

Stamping—The gross weight of falling stamps with new shoe is 1100 lb., made up as follows: Stem, 450 lb.; boss, 350 lb.; tappet, 120 lb.; shoe, 180 lb. The weight of the die when new is 140 lb. The stamps drop 6.5 in., 104 times per minute. Crushing is done in solution, using a double-discharge mortar, from 10 to 12 tons of solution were required per ton of ore stamped; with a single-discharge mortar only six tons were required.

The ore is divided into two classes: Oxidized, which is soft and friable, consisting largely of decomposed andesite with feldspar changed to clay; and unoxidized, much of which is flint-like quartz. Using punched-tin screens with holes 0.6 mm. in diameter, the stamp duty is about 3.5 tons of unoxidized ore, and with a mixture of 20 to 30% of oxidized ore, four tons per stamp. Cast-iron dies were found to cost more per ton crushed than steel dies. The consumption of steel in shoes per ton crushed was 0.52 lb. The total cost of stamping is reported at 48.8c. per ton, with power constituting 71% of the cost, wood fuel being $5.50 per cord of 180 cubic feet.

Leaching—The leaching tanks are charged by tram cars filled from the bottom-discharge doors of the collecting tanks and trammed over traveling bridges and dumped into the leaching tanks; this is done by contract at 5c. per ton. There are 14 leaching tanks, 35x4.5 ft., with canvas-filter bottoms and bottom-discharge doors. Before charging, the sand increases about 20% in volume from the collecting tanks, and will occupy from 20 to 22 cu.ft. per ton; after soaking for six hours in solution, it subsides to about 24 cu.ft. per ton. The total time of treatment is approximately 18 days. It takes one man from eight to 10 hours to discharge the sand, using a 2-in. hose under a 40-ft. head and through launders having a 3% grade. The total cost of leaching is 59.88c. per ton.

Slime Plant—In the slime plant, two collecting and 10 treatment tanks are used: the latter are 24 ft. in diameter and 9 ft. 6 in. deep. A two cross-arm mechanical agitator is used on each tank and revolving six times per minute requires one horsepower. Connected to each tank is a 4-in. centrifugal pump driven from a line shaft; running at 800 r.p.m. they handle the contents of a tank in one hour, and requires 1.5 hp. Four agitations are given the pulp; the first, eight hours, and the three following four hours each. The total cost of slime treatment is 74.9c. per ton.

Filtering—Two 60-ton capacity Oliver filters are used for filtering; the drums are 11 ft. 6 in. in diameter and 8 ft. wide and revolve once every four minutes. By using a wet vacuum and maintaining it at 26 in., the capacity of the two filters was increased to 125 tons per day.

A small compressor, furnishing from 5 to 10 lb. per min., is used to discharge the slime and agitate the pulp in the filter boxes. To operate the filters, pump and compressor, it requires 13 hp. To clean off lime, which settles on the filter cloth of the drum, requires 7 lb. of dilute hydrochloric acid and an hour's washing; this is necessary about every two weeks. There are 290 sq.ft. of surface on each drum, and the canvas lasts from three to five months; the cost of recovering a drum is given as follows: 13 yd. of No. 12 duck, 104 in. wide; 25 yd. of 8-oz. burlap; 77 lb. of No. 17 spring-steel wire and one mechanic and three helpers, 16 hours. The direct cost of filtering, not including supervision, is reported at 12.23c. per ton.

Allouez Production Costs

During 1911, the Allouez Mining Co., in Michigan, mined and treated 288,610 tons of rock, yielding 16.56 lb. of refined copper per ton, at a cost of 13.3c. per lb., according to the annual report. The cost of mining, transportation and stamping was $1.668 per ton, compared with $1.769 in 1910, when the yield was 18.84 lb. of copper per ton, resulting in an increase of 0.68c. per lb. of copper during 1911 for these items. No construction was charged during 1910, but in 1911 the charge for this account amounted to 0.90c. per lb. copper. These two charges account for nearly all the increase of 1.83c. per lb. during 1911 over the 1910 costs. Smelting, freights, commissions, etc., was 1.95c. in 1911, compared with 1.81c. in 1910; 1.51c. in 1909; and 1.4c. in 1908. Slightly over 2% of the rock broken during the last two years has been discarded by hand sorting.

During a five-year period, 1906-1910, the Allouez produced 17,355,301 lb. of copper from 1,114,085 tons having an average yield of 15.6 lb. per ton. The average cost of production was 17c. per lb., made up of 13c. for mining, transportation to mill, milling, smelting, refining and selling, and 4c. for construction and other expenses. The average cost during two-year period 1909-1910 was 12.3c., and for 1910, 11.6c. per lb. Not including a payment on stamp mill, the cost during the five years was about 15c. per pound.

Methods of Teaching Rock Drilling

By L. E. Young*

A unique method of demonstrating the principles of rock drilling is used at the University of Missouri. A frame covered with chicken-coop wire represents the face, behind which is a second frame covered with finer wire; a piece of canvas thrown over these frames represents a tunnel. Tin tubes with hooked ends are pointed by a dummy rock drill through the front and hooked to the back screen. Removal of the canvas shows the tubes in the position of drill holes in a face.

*Director, School of Mines and Metallurgy, University of Missouri, Rolla, Mo.

The mining department of the University of Missouri has developed methods and equipment for demonstrating in the class room and in the laboratory a number of important points in the practice of rock drilling and blasting, particularly as applied to drifting and tunneling.

Almost everyone who has attempted to teach rock drilling and blasting has been handicapped by the difficulty of instructing a large class of students in drifts and tunnels where only a few students can hear and see the instructor; by the difficulty underground of making students realize just where the holes are bottomed; by the difficulty of getting the student to realize exactly where the charge of powder goes; and by the impossibility of actually showing underground anything more than the drilled face of the drift before the charge is ignited, and the broken rock or the missed hole after the blast. Instructors have wished that they could show the bottom of each hole. It has seemed impossible to illustrate graphically the actual position of the several charges of dynamite and to demonstrate the distribution of the powder through the rock to be broken in tunneling and drifting.

The equipment described in this article was designed primarily with the idea of inducing the student to think (in this exercise at least) of the bottom of the drill hole, of the actual volume of the rock to be broken by the powder, and of the new face of the drift rather than —as the student generally thinks—of the face of rock exposed, of certain customary set-ups of the drill, and of holes drilled according to custom. The idea has been to make the student think for himself and to give him an opportunity to see what can be done from certain set-ups of the rock drill.

STUDENT POINTING TO A HOLE WITH DUMMY DRILL

HOLES REPRESENTED BY TIN TUBES

The equipment consists essentially of the following: (1) Light-weight, full-size columns, bars, arms, and rock drills made of wood. Light-weight apparatus is used in order to save time and to make it possible for one man to demonstrate rapidly the various points under discussion. The rock drill is used only to show the position of the drill steel relative to the arm and the columns and the length of the feed. (2) Telescopic tin tubes are used to represent the holes drilled. The tubes are made in 2-ft. lengths of various diameters, as 1¼, 1⅜, 1½, 1⅝ in., etc., to represent the portion of the holes drilled with steel of a given gage. (3) Colored oilcloth is wrapped about the tin tubes, to indicate the position of the dynamite in the hole. Rubber bands are used to hold the oilcloth in place on the tin tubes. (4) A portable, light-weight, 4-piece timber set, 5x7-ft. in the clear, is used to support the column or the bar. This is not intended to represent mine timber. (5) Portable screens are placed parallel to the 4-piece set. The purpose of the screens is to support the tin tubes when placed in position to represent the holes drilled. A sheet of paper is stretched over the screen near the 4-piece set and indicates the position of the face of the drift. The other screen is placed in position to indicate the face to which the drift will be advanced after the round of holes has been fired. The hook on the bottom of each tin tube representing a drill hole is hooked on the screen representing the face to be won, and the other end of the tube is supported by the rear screen. (6) Five 1x3-in. wooden strips are used as braces for the screens and the 4-piece set, and to support the canvas covering. (7) A canvas covering represents the walls and back of the drift. There are suitable eyelets for attaching the canvas to the wooden strips. This canvas covering is generally not required as most of the students conceive the position of the walls and back without this actual inclosure. (8) Cardboard letters and numbers are used for labeling drill holes. These indicate the order of drilling, the set-up from which the hole is drilled, and the order of firing. (9) Wires are used to support the tin tubes which may be required to indicate the position of short cut-holes.

USE OF EQUIPMENT

The use of this equipment may be illustrated as follows: A student is asked to demonstrate a set-up of a rock drill in a 5x7-ft. tunnel, and to show how the holes are placed. The equipment is placed at the beginning of the demonstration as shown in Fig. 1. Having explained where he expects to bottom each hole of the round necessary to break ground, the student shows the first set-up and indicates where the second set-up will be, if more than one set-up is necessary.

The front screen is then covered with paper in order that the student may not have an opportunity to see more than he would if actually drilling into a face of rock. He then points each hole from the set-up, placing and hanging on the wire screens the several tin tubes necessary to show each hole drilled. He must show actually the size of hole he would drill, the necessary changes of gage of the drill bits, the angle of the hole, and the amount of powder charged. As designated by the student, one tin tube is put in place for each hole of the round. The student is not permitted to change any hole after it is bottomed. If more than one set-up is necessary, the work is carried on for the remaining set-ups in the same manner as for the first until each hole of the round is shown.

After the round has been placed, the paper is taken down showing the tubes as illustrated in Figs. 2 and 3, then the

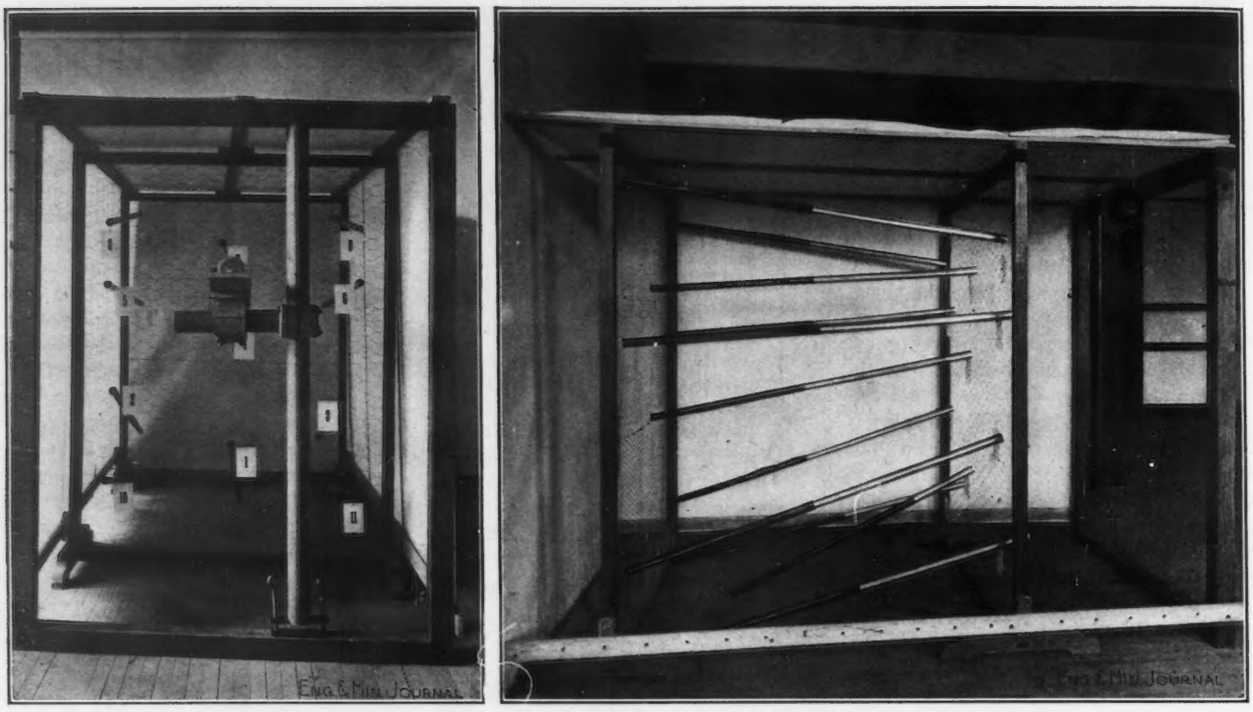


FIG. 2. ROUND OF HOLES AS DRILLED AND LOADED IN THE PORTLAND MINE, VICTOR, COLO.

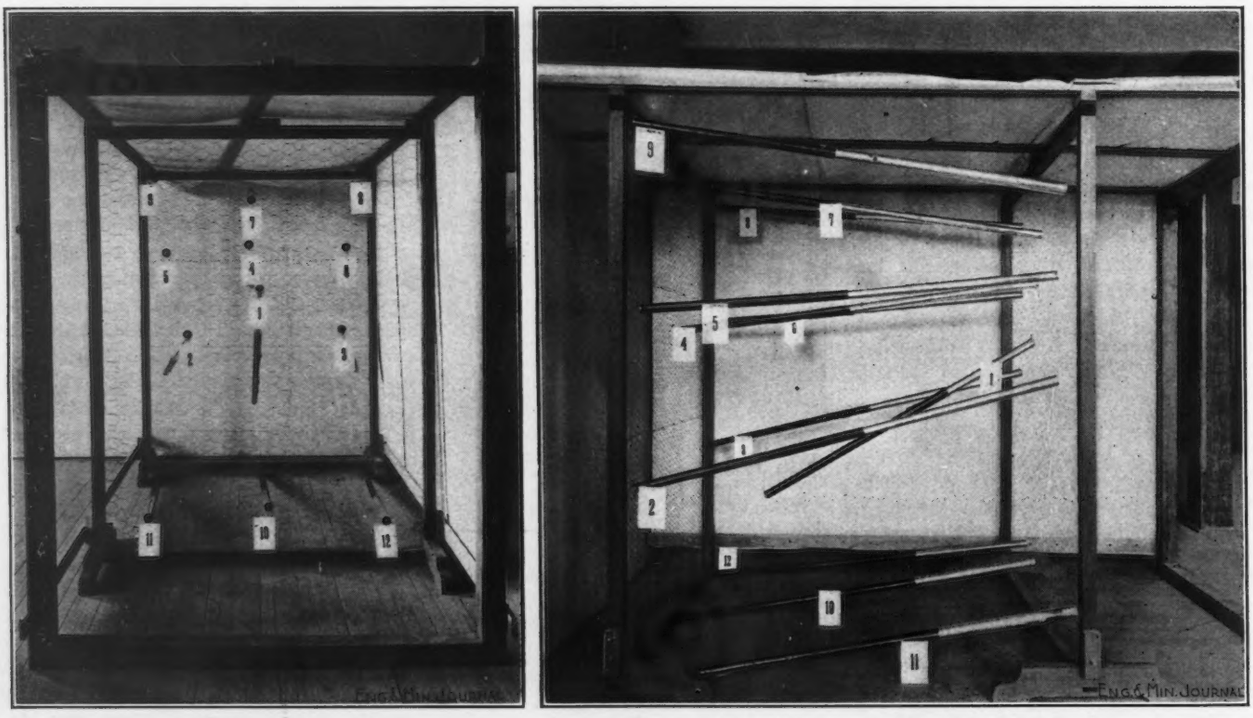


FIG. 3. ROUND OF HOLES AS DRILLED AND LOADED IN THE LEONARD MINE, BUTTE, MONT.

student can examine and criticize his work. The instructor points out, among other things, the following: (a) The total footage of holes the student has used for the round. (b) The holes that are unnecessarily long. (c) The danger of shooting the collar and primer off certain holes, providing the primer is put in last. (d) Any improvement possible in the angle of the holes, that is, where uppers might have been drilled to advantage instead of down holes or *vice versa*. (e) The position that would have made a more effective set-up. (f) Any improvement possible in the proportioning of the burden on each hole.

The student is reminded in each demonstration of the desirability of breaking the rock to a suitable size for shoveling; of the importance of having the "muck" thrown back from the face; of the importance of having the holes square the drift for the next round; and of the importance of placing the dynamite so that there may be no undue shattering of the walls and of the back.

It is not intended that this should in any way reduce the necessity for or the importance of demonstration and work with rock drills in a mine, but it has been

found that many points may be made clearer by the use of this supplementary equipment. Moreover, the fact that there are "slips" and joints in rock has not been forgotten and that a set-up will depend largely on the way the last round broke. If the equipment and method described does nothing more than train the student to think of the burden he is putting on each hole, it will have accomplished much. These demonstrations have been of benefit to many who have had large experience in tunneling and drifting in hard rock.

Larger screens and other equipment are now being prepared in order to demonstrate graphically the pointing and loading of holes, and order of firing in tunnels of large cross section, such as the Roosevelt and the Laramie.

The Caspar, Wyo., Oil Field

SPECIAL CORRESPONDENCE

The importance of Caspar oil field in Wyoming has, in my opinion, been underestimated. The field has been worked in a desultory manner since early times. A number of people have been working in and about the field on a prospector's and promoter's basis, but no real development work was done until last year.

The early history of the French and Dutch companies operating here would be extremely interesting reading. Some men, I understand, have been living at the rate of $40,000 to $50,000 per year on subscriptions collected from gullible French and Dutch investors, for work to be done on the oil locations north of Caspar; instead of work being done, paper locations were filed and the money used by the gentlemen "where it would do the most good." This was the history of the field for nearly 20 years. The resulting titles have, of course, become what might be termed "mixed."

The state of title frightened off a number of people with capital, but finally V. Z. Reed of Colorado Springs, now of France, had the necessary nerve to go ahead and is now being duly rewarded. In the short space of one year he has opened up a number of new wells, two of them being gushers. A 40-mile pipe line has been laid and a refinery built at Caspar, the capacity of which at present is about 2500 bbl. per day. Orders have been placed, however, for increasing it so that by autumn it is the expectation that the refinery capacity will be 8000 bbl. per day. There is not a dry well in the field and others are now going in. This summer will see a great deal of drilling and I doubt not that this development will be profitable.

Damage by Electrolysis

BY E. W. STEVENSON*

The rapid development of the use of electricity in mining, particularly for tramming, has already led to serious results due to the ignorance of some mining engineers of the damage done to piping, metal beams and sheathing of supply cables by stray return currents where a grounded return is used, and which of course must be used when the rails are a part of the circuit.

The subject of electrolysis by stray currents has been amply covered in the voluminous reports and books published in the electrical and railroad journals from time to time in the last 15 years. The street-railroad journals are perhaps the best source of information, for it is the current from the trolley systems that has been doing the most damage all over the country, there being hardly a town in the United States which has not at some time had its steam, water, gas pipes or lead sheathing of electric cables partly or totally destroyed by these stray currents. The trouble is not exactly caused by the current getting into these pipes or cables but in getting out of them, for wherever one ampere of current leaves a pipe on its return to its source, it takes with it 20 lb. of metal per year and deposits it upon the adjacent medium which may be a puddle of water or a network of other pipes or anything which is of low electrical resistance, and a convenient jumping-off spot for the current.

ELECTROLYSIS OF A POWER CABLE IN A SHAFT.

I was called upon recently to investigate a case in which a cable had failed due to several breakdowns of the insulating cover. The cable was of considerable length, over 1000 ft., and had been built with a view to sustain itself for the entire length, should it be found necessary. It was built for 600-volts service, but only 250 volts were used on it and its size was sufficient to carry over 50 kw. at less than 5% drop. The rubber cover was protected by 5/64 in. of lead, a bedding of jute over the lead, and eight galvanized armor wires of steel at regular intervals with sufficient jute in the interstices was put on to take the weight should it have to be suspended as mentioned before. As the shaft is called a "wet" one it was thought advisable to apply a final layer of two tarred-jute coverings over these armor wires. The total weight of the cable was about 3500 lb. This final layer was thought to be a protection from the sulphurous water of the mine.

The cable was installed one year ago and it was a surprise to the factory where it was made when they were told that it had failed. Upon examination several faults were discovered and in every case these faults were found to be in a similar position as regards the timbering of the shaft. The cable instead of hanging free, had been attached to the shaft timbering; the wall plates of which were spaced three feet apart.

As a protection a light board had been placed over the entire length of the cable. The mine water ran out of the vein about 500 ft. from the collar of the shaft and for about 300 ft. the cable was soaked through with this water. It was reported that this water was the cause of all the trouble, but a cursory examination was enough to show the cause, for in all instances where the lagging was wet the cable was eaten away at a point just below. Where this action had taken place, the cable under the outer jute cover had swollen to a diameter of 2 in., while its normal diameter was not more than 1¾ in. This swelled spot extended from about three inches below the lagging to the same distance above, and on reaching out from the cage, and grasping the swelled spot firmly in the hand it was quite possible to pull away a mass of disintegrated material containing jute, salts of iron and zinc, and parts of thoroughly pitted lead covering; a clear case of electrolysis. Besides, there was a decided crater in the metal coverings where the damage had not gone too far. In extreme cases the armor wires were worn off to a point, and the current going to ground had been so strong as to raise the temperature sufficiently to warm the rubber insulation and finally burn it off, making the grounds on the circuit which first called attention to the trouble.

BARE COPPER CABLE ON OPPOSITE SIDE OF SHAFT.

The engineer in charge could not understand why electrolysis had caused the trouble for he said he had ample returns in his circuit and showed me a bare copper cable suspended on the other side of the shaft of a similar capacity to the damaged cable. But on examination, it was found that the bare strand merely went to the botom of the shaft and was there bonded to the rails. While all the rails through the different tunnels were supposed to be adequately bonded, no tests had ever been made by a sensitive voltmeter to show if there was any current escaping into the ground at any point. Such a condition was likely at any time to result in serious disaster, for alongside of the tracks at certain spots was a line of piping for distributing compressed-air. Stray currents will take advantage of any path and is quite likely that this pipe is thin at spots and may give trouble in the future.

*Electrical engineer, Hazard Manufacturing Co., Wilkes-Barre, Penn.

The above is merely cited as an example of what may occur if conditions are not carefully investigated before construction of transmission lines is begun. There is this fundamental difference between a traction system in a town or city and in a mine. The traction company sends out current along its lines to the farthest end, relying on the rails to bring back the current to the power house, some companies are careful about bonding, and some run out returns to centers where the current can be taken care of, for they find it to their interest to do so. But in any case they are not doing any damage to themselves, except possibly digging into their coal pile a little more than is necessary. The sufferers are mostly the individual house owners for their service pipes are destroyed. Occasionally though some of the water company's mains blow up and then there is trouble, or perhaps large multiple lead-incased paper cables belonging to the telephone companies are troubled from the same cause. But with the mines, it is an entirely different matter. There, the damage is done to the property of the mine and it is necessary to take adequate precautions to prevent it.

NECESSITY FOR WELL-BONDED RAILS.

For mine work generally, when lead-incased cables or armored or both types are used, where it is impossible to prevent current from getting astray, the other sheathing should be carefully and solidly bonded to the return grounds. For instance in the example given, if the simple plan of joining a bare copper wire across from the outer sheathing of the cable which had been damaged, to the return, had been followed all the current would have been deflected away from the sheath and no possible damage could have been done. This should have been repeated at intervals of not less than 50-ft. Then enough copper should be used along the tracks to which the rails should be bonded at intervals, especially in the vicinity of spurs, cross overs, and switches, for there is always more or less trouble at these points and bonds will work loose. The return conductors should really be slightly in excess of the outgoing feeders, but some reliance can be placed on the metal rails to take care of this excess.

There are many good types of bonds on the market, and also good bond testers, and both should be thoroughly investigated and used. A special crew should look after this work, making surveys at definite and frequent intervals. For ordinary use, the center-reading milli voltmeter is a handy instrument; it can be carried by one man and armed with a metal pointed stick he can reach any convenient spot where he wishes to test for a stray current and its direction.

Most electrolysis is supposed to be caused only by a direct current, but there have been several instances recently described in the electrical journals where damage was caused by an alternating current. Several cities have made ordinances controlling trolley systems, and it is generally agreed that a difference of potential of not more than ¼ volt should exist between the rails and any adjacent pipe or conduit which is not supposed to have anything to do with the circuit.

Engineers should remember that however well they have been able to get rid of stray currents at one time, these currents are like the mine rats, always looking for a chance to come back again, so they must be on the lookout for these currents, and surveys should be made at regular intervals. Changing the polarity of a current has been suggested as a remedy; it may be a remedy temporarily but it merely changes the place of the electrolysis and the best thing to do is to stamp it out entirely, or as far as possible, and then keep it out.

Old Dominion Company

The Old Dominion Company is a holding company, owning 155,245 shares of the 162,000 of the Old Dominion Copper Mining & Smelting Co., and all of the United Globe Mines stock. Its receipts for 1911 were $493,211, its expenses $7,222 and its dividend disbursements $439,867, or at the rate of $1.50 (6%) per share.

The Old Dominion Copper Mining & Smelting Co., operating in the Globe district, Ariz., produced 26,482,019 lb. of fine copper, 132,722 oz. silver, and 2831 oz. of gold, of which 19,195,181 lb. of copper, 42,051 oz. of silver, and 936 oz. of gold came from its own ores. The copper sold for an average of 12.39c. per lb., and cost 7.65c. per lb. at Globe, after deducting gold and silver receipts, or 9.15c. per lb. at New York.

Development work in 1911 consisted of 7600 ft. of drifts, 2568 ft. of raises, 199 ft. of shaft, and 80 ft. of winzes in the Old Dominion vein. The average grade mined was 5.84% cu. (7.75% for the smelting ore; and 3.50% for the concentrating), at an average cost of $4.18 per ton, as against $5.17 in 1910.

Lessees mined 5378 tons of iron flux from the upper levels and 258 tons of smelting ore, and 2219 tons of siliceous converter lining from the Keystone, while about 19,000 tons of smelting ore were obtained by working over the old stopes from the second to the eleventh levels. From the orebodies west of the west fault about 48,000 tons of oxidized smelting ore were extracted. The remainder of the year's production came from the ground east of the west fault, with the exception of a small amount from the Kirkey vein.

The average flow of water has been about 500,000 gal. per day higher than in 1910. During the year 1,000,000 gal. of water per day were sold to the Miami Copper Co., and now 2,000,000 gal. daily are being delivered.

During the year 140,230 dry tons of ore were concentrated at a cost of $1.012 per ton, and 231,603 tons of charge smelted at a cost of $2.568 per ton. There were no great changes in these departments.

In the concentrator a set of 30x16-in. rolls and an Evans-Wardell chilean mill, and in the smeltery an ore-mixing system were installed. In 1912 it is purposed to increase the concentrator capacity by 650 to 750 tons per day, and to build a separate converter dust chamber. The cost of converting was $8.26 per ton of fine copper, as against $9.68 in 1910. The power costs for 1911 were $83.77 per horsepower-year, against $96.18 in 1910. A new contract for fuel oil should cut present figures by 20 per cent.

From the United Globe mines there were 110,579 tons extracted in 1911, of which 84,877 tons went to the Old Dominion smeltery; 21,851 tons to the Copper Queen; 2843 to the Calumet & Arizona; and 1008 to the El Paso smeltery. There were 11,669 ft. of development and extraction work done, on the Old Dominion, Buckeye, Buffalo and Gray No. 3 veins.

The ores of the United Globe mines consist chiefly of two classes: Ores so high in silica that they cannot be profitably smelted locally, but are used elsewhere in the Southwest as converter linings, or for an acid flux; and granular sulphides, most of which must be concentrated before use. While the quantity of sulphides developed on the United Globe property would be sufficient to supply local demands, it is better to secure favorable freights on outbound siliceous tonnage by hauling sulphides from Bisbee as return freight. However, the probable preponderance of siliceous ores in the unexplored eastern sections of the United Globe property suggests the advisability of considering some leaching method, in which case the sulphide ores already exposed will meet all demands of the furnace plant.

There was no domestic monazite marketed in 1911, although 13,132 lb. of crude sand was mined in the Carolinas, according to the U. S. Geological Survey. There were 3208 lb. of zircon produced. The oxides of the rare-earth metals contained in these substances are used in gas-mantles and the glower of the Nernst lamp.

Copper Smelting at Kyshtim

By Ernest J. Carlyle *

A modern copper smeltery is now in operation on the Kyshtim estates in the Urals. Pyrite smelting is practiced in the two furnaces, blast for which is supplied by turbo-blowers. The matte containing 30 to 40% copper is blown to blister copper in Peirce-Smith converters. Gas-fired regenerative furnaces of the Siemens type are used for smelting fines and flue dust.

*Metallurgist, Woodstock, Ontario.

One of the most interesting of recent Russian mining enterprises is that of the Kyshtim estates in the Urals, which are being exploited by an English company, the Kyshtim Corporation, through a subsidiary local organization, the Kyshtim Mining Works Co., with headquarters in St. Petersburg. The estates comprise about 1,500,000 acres of land from which, for over a century, timber, iron and gold have been produced. As the eastern part of the estates is traversed by the Trans-Siberian Ry. and the western portion connected with the Volga by the Ufa River, the facilities for marketing the various products are excellent. Moreover the government is making a survey for a railway line which will pass through the western part of the property.

The headquarters of the estates are at the town of Kyshtim on the railway. Twenty-five miles to the south lies what is known as the Soimonovsk Valley. The existence of copper ores in this district attracted the attention of English capitalists, in 1907, who proceeded to prove the deposits and to arrange for the beneficiation of the ores. Their efforts have culminated in the development and equipment of four important mines, the construction of a 36-in. gage railway connecting the mines with the government line at Kyshtim, the erection of a large electrolytic refinery in that town, and finally the completion of the Karabash smeltery in the Soimonovsk Valley.

GENERAL VIEW OF THE KARABASH SMELTERY, IN THE SOIMONOVSK VALLEY, KYSHTIM ESTATES IN THE URALS

LARGE TONNAGE OF ORE EXPLORED.

The cupriferous ore reserves proved by diamond drilling and underground development are, as stated in the last annual report, 1,817,000 long tons and the indications of large additions being made to this reserve as exploration continues are excellent. One of the four mines yields barren pyrites which because of the large proportion of sulphur it contains, commands a ready market in Russia. The copper ore in the proportions supplied by the various mines, is of the following composition: gold, 0.1 oz. and silver, 1.0 oz. per long ton; copper, 3 to 4%; sulphur, 40.8%; silica, 12%; iron, 34.1%; lime, and other earths, 3 to 6%. Numerous deposits of quartz containing from 88 to 95% silica and small quantities of gold, occur within easy reach of the plant and railway, and limerock is quarried about two miles from the smeltery. Obviously the conditions favor pyrite smelting.

TWO EXPERIMENTAL PLANTS OPERATED.

As early as 1907, the company was producing copper at a small plant at Kyshtim, and early in 1908 a second plant was blown in near the principal mine. The first of these plants consisted of two circular water-jacket blast furnaces, each of a daily capacity of about 70 long tons of charge, one stand of converters, and a small refining furnace. The second consisted of three furnaces identical with those at Kyshtim.

Eventually one of the Kyshtim furnaces was transferred to the Soimonovsk plant, thereby increasing the capacity to about 200 tons of ore per day. The resulting matte, ranging from 15 to 25% copper was carted to Kyshtim, raised to converting grade in the remaining furnace, and blown to blister. This was refined, at first in the original poling furnace, but ultimately in the anode furnace which was built at the new electrolytic refinery. Both these smelteries were regarded merely as experimental plants. Small and unsatisfactory to operate as they were, these plants served to develop the process of smelting the ore and to train workmen, and they yielded substantial profits to the company.

THE KARABASH PLANT.

The present plant was completed early in 1911, at Karabash Lake in the Soimonovsk Valley. The site chosen was a hillside adjoining the lake at a point midway between the principal orebodies. At the foot of the hill an old river bed provided ample space for a slag dump, and beyond this depression lay an expanse of well-drained, level ground on which were erected the office, laboratory, and dwellings of the staff and workmen. One spur from the railway connecting the plant with the mines was carried around the hill by comparatively easy curves and

gradients up to the ore bins, a second spur at an intermediate level to handle sample-mill rejects and fuel for the power plant, and a third on the ground level of the plant was carried to the main smeltery building to handle the finished products and to serve the machine shop and warehouse.

The ore is brought from the mines in bottom-dump steel cars of 10 tons capacity. It is weighed at the plant junction on a standard Fairbanks scales of 3000 poods (50 long tons) capacity; the platform will take easily three ore cars. Every tenth car in rotation from each mine is dumped into a receiving bin at the sampling mill, which stands at the approach end of the main ore bins.

The sample mill is equipped with a 9x15-in. Blake crusher, the product of which is raised by a bucket elevator to the top floor and discharged into a sampler of the Vezin type which cuts out one-tenth and delivers it to 30x10-in. Allis-Chalmers rolls. One-tenth of the product is then cut out by a second and smaller sampler, and passed through 24x10-in. rolls into the final sampler which cuts out one-fifth or a final sample of 0.2% of the original car sample. The rest of the ore, and ultimately the rejects from the sampler, are dumped into flat-bottom bins of approximately 6000 tons capacity.

In the floors of these bins are series of longitudinal slots 30 in. wide that may be covered by close-fitting but easily removable 4-in. planks. Movable chutes, equipped with inverted-arc gates, are suspended below the slots from rails.

The procedure in withdrawing ore from the bin is to place a chute beneath the toe of the slope of the ore above, then to remove two or three of the planks at that place. As the ore is removed, more boards are taken up as the toe of the slope recedes toward the back of the bin. With a steady supply of ore to the bins, it is seldom necessary to move the chutes, which then serve as stationary gates. When occasion demands, the slots provide a convenient opening for cleaning out a section of ore. The chutes discharge into the cars, in which the ore is taken to the furnace feed-floor.

Beneath the chutes from the ore bins on the blast-furnace charge-floor level are laid 24-in. gage tracks made of 54-lb. rails, which lead to the blast furnaces. The charge trains, three in number, consist of four side-dump steel cars, each of 4000-lb. capacity. They are hauled by Westinghouse electric traction motors weighing three tons, and equipped with 18-hp., 220-volt, direct-current motors.

The blast-furnace charges, made up of ore, quartz, limerock, plant cleanup, converter slag skulls, etc.) and low-grade matte from the Siemens furnaces mentioned below, are delivered to the furnaces as follows: First flux train consisting of four cars, each containing a weighed mixture of quartz, limerock, cleanup, etc., is brought, say, to the east side of a furnace and dumped through the four charge doors on that side. Then two 4-car trains of ore are brought in, one on each side, and dumped. This constitutes one charge. On the succeeding trip the flux comes in on the west side and so on. A charge thus consists of three train-loads, and weighs about 50,000 lb. The coke is shoveled in through the end doors just before the flux train is dumped. The ratio of coke to total material charged during any given month is a little under 1.25 per cent.

The Blast Furnaces

There are two blast furnaces each measuring 300x48-in. at the tuyeres, and 22 ft. 8 in. from the bottom plates to the charge floor. They are jacketed with three tiers of water-jackets on the ends and two on the sides; but side jackets are being made which will extend from the bottom to the apron plates. There are two bronze tap jackets on each furnace, one in the center of each side.

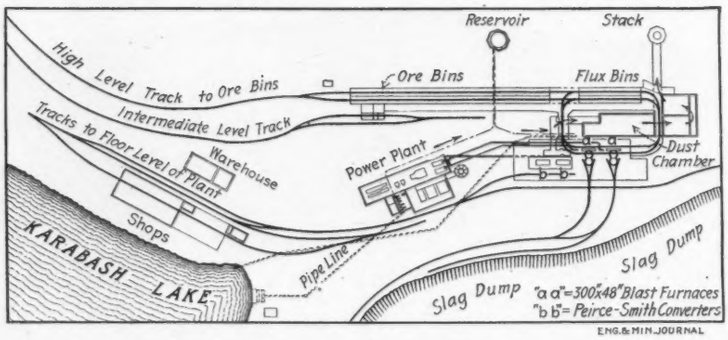
The spout used at the front of the furnace is shown in an accompanying sketch. It is a plain, water-jacketed, slag spout that is lined with magnesite brick before being used. The blast is trapped by a water-cooled nose piece or dam of blister copper. As shown in the sketch, this dam does not cover the entire front opening of the spout proper, but leaves a fairly large open space below its bottom edge and the upper face of the spout. This opening is filled with clay and is provided for the purpose of affording a convenient means in case of emergency for quickly emptying the hearth of the furnace of all molten material—a strong thrust with a bar being sufficient to break through the clay stopping.

The tap jacket at the rear serves a useful purpose when a furnace is being blown in, inasmuch as the slag produced during the first 20 or 30 min. is discharged from the back rather than into the settler. Besides this, of course the back taphole is useful if through any cause the front tap is lost, as the blast can be kept on and the matte and slag run through the back till the breast can be drilled.

The air is delivered through a 24-in. bustle pipe to 52 tuyeres, 26 on each side of the furnace. Of these, however, the four tuyeres above the bronze jackets are seldom used so that the working complement is normally 48 tuyeres.

Originally the slag and matte flowed into two 15-ft. settlers arranged in cascade, but eventually these were thrown into one because, owing to the frequent tapping for the converter, the supply of matte entering the lower settler was insufficient to keep it hot and open. With a common settler there is a uniform depth of matte, and as the four tap holes are used in rotation the settler bottom and the tapholes themselves are easily kept in good condition.

At first all settlers were lined with refractory brick in order to resist the corrosive action of the low-grade matte. Recently, however, following the practice at the old plants, a settler has been lined with soapstone quarried on the estates and cut into shapes of the required dimensions. This is satisfactory and cheap.



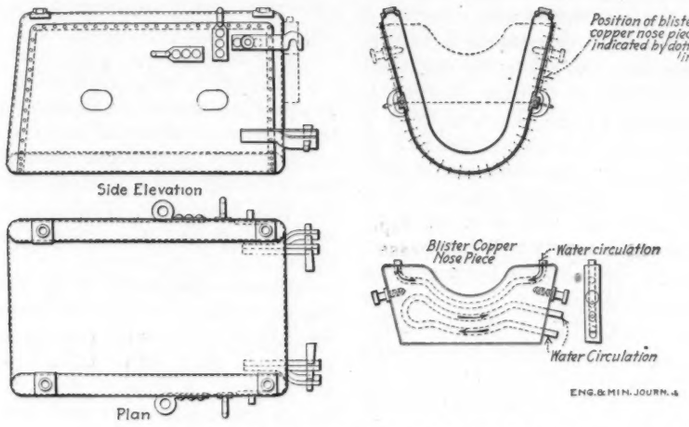
Ground Plan of the Karabash Works

Slag Disposal

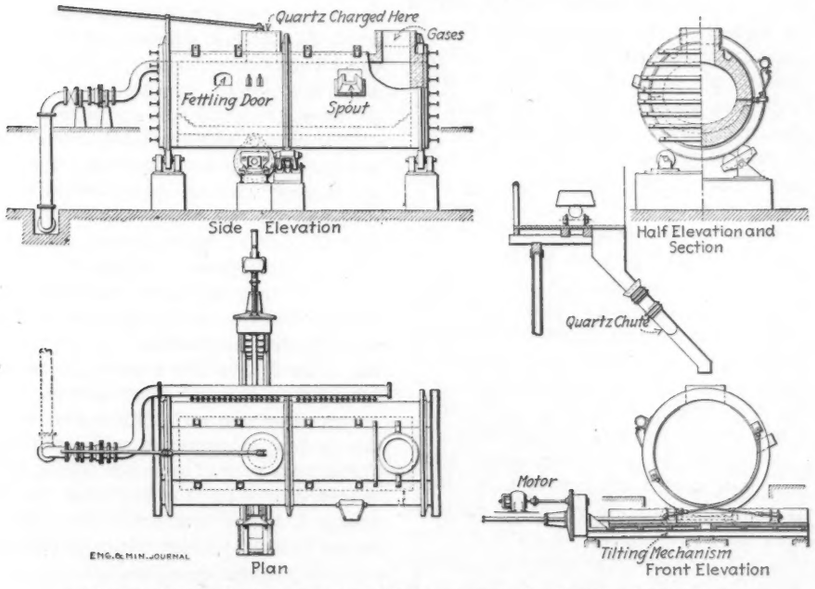
Each settler is provided with two slag spouts on opposite sides of the forward end, through which the slag is led into 4-ton cars consisting of cast iron, elliptical bowls, mounted on substantial trucks. Two such cars are placed on each side of the settler. When they are full the slag stream is diverted into the pair of cars on the other side of the settler and the full pair hauled to the dump by a small locomotive. In addition to this haulage system, there is installed beside each settler a launder through which in case of accident to the locomotive or other trouble, the slag is granulated and carried to waste by turning in the overflow water from the jackets.

The matte produced at present contains from 30 to 40% copper. With this concentration each furnace smelts from

500 to 600 long tons of charge per day. During a recent month the average charge was made up as follows: Ore, 28,800 lb.; quartz, 6350 lb.; lime rock, 1900 lb.; cleanup, 1300 lb.; matte, 2250-lb.; a total of 40,600 lb. of ore and fluxes to which was added 500 lb. of coke, or 1.23% of the total charge. The resulting matte contained 31.2% copper and the slag for the month averaged 31.9% silica, 41.2% iron, 4.4% lime, 1.5% sulphur and 2% alumina. The copper in the slag varies from 0.3% to 0.5. Other things being equal, cleaner slags are obtained when the matte fall is high.



SLAG SPOUT USED ON KARABASH BLAST FURNACES



BASIC LINED CONVERTERS AS USED AT THE KARABASH SMELTERY

REVIEW OF THE SMELTING PRACTICE

Using large charges simplifies transportation, and since in pyrite smelting the sulphides, fused in the upper part of the furnace, are fluxed at the smelting zone by the quartz which has preceded them thither in previous charges, there appears to be no object in employing smaller charges, to obtain the intimate mixture at the furnace top which is desirable in ordinary smelting. The usual characteristics of pyrite smelting, basic slags, dark tuyeres, and a porous accumulation slightly above the tuyere line, are in evidence. With adequate supervision any tendency of the smelting focus to mount in the furnace is easily defeated, and the length of furnace campaigns is affected more by outside influences than by difficulties arising from the process. At the time of writing a furnace was shut down after 118 days vigorous running, and the shut down was directly due to a leaking jacket. The half of the furnace not affected by the water was running normally up to the time of blowing out. With the ferruginous slags produced there is, it is true, a tendency for the settlers to chill and build up more rapidly than in ordinary practice, but this difficulty is overcome by shutting off the water spray on the settler shell, and by occasionally making low-grade matte for a few hours. It is safe to say that in the absence of accidents, furnace campaigns of six months or longer should be the rule rather than the exception.

MUCH FLUE DUST PRODUCED

Being pyrite the ore decrepitates vigorously in the furnaces, and as the sulphides from the upper levels of the various mines are soft and friable, there is a large production of flue dust, and although the ore is now screened and only the coarse ore sent to the blast furnaces, the dust recovered never falls below 10% of the ore charged. This dust is collected in a masonry chamber which the gases from each furnace enter through two downtakes 6-ft. in diameter. The chamber is so constructed that the gases travel for a distance of about 100 ft. through a compartment with a cross section of 945-sq.ft., and then through two compartments each 60-ft. long and of 1610 sq.ft. cross-sectional area. After leaving the first compartment the gases pass through four walls in which, midway between roof and floor, are openings so spaced as to produce a maximum diffusion and hence a minimum velocity of the gases.

The chamber floors are made of flat cast-iron arches, perforated with 6-in. openings in which rest conical castings. These are fitted beneath with spindles and handles by means of which the trammers on the track floor below force the cones upward, and so permit the dust to flow into cars. From the chamber the gases are led through a flue 12x12½-ft. inside up a slope of 31°, to a stack 16-ft. in diameter and 185-ft. high, the top of which is 241-ft. above the blast-furnace charge floor.

FINES TREATED IN GAS-FIRED REGENERATIVE FURNACE

Even in the original small plants the smelting of the ores was accompanied by a large production of dust. For a time part of this was briquetted with tar and pitch from the producers in the iron works, but this method was inadequate to cope with the rapid accumulation of dust. K. D. Koliasnikof, then superintendent of the Kyshtim works, and my successor as manager of the Karabash plant, solved the problem by treating the dust in a gas-fired, regenerative furnace of the Siemens type, which had formerly been used for the production of openhearth steel. With cheap wood available for the producers, he rapidly developed a satisfactory and economical process. Upon the completion of the new plant at Karabash he was authorized to build a second and larger Siemens furnace at Kyshtim, and these two units are now treating not only flue dust, but also fine sulphides screened at the mines from the ore hoisted for the smeltery. The product, a low-grade matte,

is shipped to the Karabash plant and is a welcome constituent of the blast-furnace charge.

Peirce-Smith Converters Used

While it has been proved to be feasible, especially with the above-mentioned matte on the charge, to produce in one operation matte containing 30 to 40% copper, experience at the old plant indicated that easier running and better furnace performances generally, would accompany the production of lower-grade matte, and the original program was to produce a matte containing 20 or 25% copper and convert it direct in basic-lined converters; accordingly two Peirce-Smith converters were installed. Converters of this type were described in the Journal of Mar. 12, 1910. The shells at the Karabash works are cylindrical, 25 ft. 10 in. long by 10 ft. diameter, lined with magnesite brick. For feeding quartz, a special opening was cut in the top of the converters close to the central riding ring. When the blast is on, this opening is kept closed by a heavy cover. After the converter has been skimmed and the matte poured in, the quartz is fed through a chute from cars on the furnace charge floor level. This saves much time as the quartz can be charged while the crane is still busy with the matte ladle. Another alteration was to cut a second opening in the front side of the shell in order to facilitate fettling.

The converters are served by a traveling crane of 45-ft. span, equipped with a main hoist of 25-tons capacity, and two 5-ton auxiliary hoists. Because of the frequency with which matte must be delivered to, and slag removed from the converter, this crane is kept very busy, and a new crane is being put in, equipped with two 25-ton hoists.

Converter slag is carried by the crane and poured through launders into the blast-furnace settlers which it enters at the same point as the furnace slag and matte. As the converter slag which has cooled somewhat during transit, is heavier than the blast-furnace slag it settles rapidly and seems to act as a collector, for a long series of samples has shown that the slag emerging from the settlers for some moments after the converter slag has been poured generally carries less, and seldom more copper than the normal furnace slag.

Trouble Experienced in Converting Low-Grade Matte

The Peirce-Smith converters are easy to operate and the men soon became adept in their use. At first the original plan of converting matte containing 20% copper was followed, but it soon became apparent that this procedure resulted in rapid deterioration of the lining. Despite all efforts to keep the temperature down by the addition of scrap and excess quartz the slags would frequently fall to 18 or 20% silica, and at the temperature of formation of such slags the bricks at the tuyere line were rapidly destroyed by the abrasive action of the bath. In a few days these bricks would be worn back almost to the shell and the tuyere pipes burned away. The campaign could then be prolonged by tamping in fettling of ground magnesite and sodium-silicate solution, but this was a mere palliative and relining soon became necessary.

Eventually arrangements were made to treat only screened ore in the blast furnaces. This ended so many difficulties and so improved the smelting, that it became possible to keep the furnaces up to full capacity and make matte containing not less than 30% copper. From the time that this was done the rapid corrosion of the converter linings ceased. The use of the Siemens-furnace matte naturally makes it still easier to produce matte of satisfactory grade, and altogether, with the conditions now existing there is no difficulty in keeping the amount of silica in the converter slag up to 25% or higher.

Besides the life of the linings there is, in my opinion, another reason for serving as high-grade matte as possible even to basic-lined converters. Since weight for weight, air at 15-lb. pressure is more expensive than air at 40 of 50-oz. pressure, it should be in most cases cheaper to oxidize and slag iron in the blast furnace than in the converter. Our cost sheets indicate that the air required to convert matte containing 20% copper costs about half as much as that required for matte containing 16%, whereas the difference in the cost of blast to the furnaces when producing these mattes was insignificant. The difference in favor of oxidizing the iron in the blast furnace is, of course, all the more pronounced when pyrite smelting is practiced.

When the copper of a previous "blow" has been poured, the converter is fettled if necessary, with the magnesite mixture; from four to six ladles of matte are then charged and sufficient quartz to raise a good slag. When this is formed it is poured, another ladle of matte, and more quartz added, and so on, the matte being gradually concentrated until there is a sufficiently large bath of white metal to finish. When a "blow" is finished the copper is transferred by the crane in 5-ton ladles to a casting machine of the endless-conveyor type. By tilting the ladle with the auxiliary hook the copper is poured into the moving molds and chills rapidly enough to fall out easily as they pass over the sprocket wheels at the delivery end of the machine. The bars are then trimmed, weighed, and shipped to the refinery at Kyshtim.

Furnace Blast Supplied by Turbo-Blowers

The equipment of the power plant need hardly be described in detail because with one exception the machines are typical of any modern smeltery of the same size. That exception is the blowers serving the blast furnaces. These are turbo-blowers, installed by Parsons & Co. of Newcastle-on-Tyne, under guarantee of the following capacity:—

Air Pressure oz.	Free air cu.ft.	Steam lb. per hr.	R.P.M.
60	30,000	10,700	3,400
50	24,700	7,770	3,000
40	22,700	6,100	2,700

Because of the arrangement of steam mains it was difficult to make a test to ascertain the steam consumption of these blowers under actual working conditions, but they have been satisfactory so far as operation and maintenance are concerned.

We soon found that with the deep charge employed it was not possible to force 30,000-cu.ft. of air per min. through a furnace even under 60-oz. pressure, and to keep the pressure down to 40-oz. as we preferred, the blower had to be run much below full speed. This led us to try running both furnaces with one blower, keeping the other as a stand-by, and this became regular practice save when both furnaces were very loose, or when one furnace appeared to be taking air at the expense of the other. Two requisites for efficient turbine performance are, of course, superheated steam and a high vacuum in condensation.

The above notes may serve to give a general idea of the equipment and process at the Karabash smeltery. In conclusion it may be stated that while the difficulties incidental to the erection of a modern plant in a district so remote as the Urals and to the bringing of such a plant up to satisfactory production, have not been trifling. The Karabash smeltery is now in operation with gratifying results; the copper produced during 1911 exceeded the amount predicted by the company's consulting engineers, and a steady increase in the future is assured.

U. S. Quicksilver Production

The total production of quicksilver in 1911 in the United States was 21,256 flasks of 75 lb. each, the greatest output since 1907, says the U. S. Geological Survey. California produced 18,860 flasks of this total, Nevada and Texas the remainder. Although this is an increased production over 1910, it is below the decennial average ending with 1911, of 26,610 flasks. Imports were 6293 flasks (471,944 lb.), and exports were 291 flasks (21,825 lb.) in 1911. The exports were the smallest and imports the largest for many years.

South African Power Supply Projects

By Owen Letcher*

A history of the power-supply companies that were finally consolidated as the Victoria Falls & Transvaal Power Co., which had the ambitious object of harnessing Victoria Falls, on the Zambesi River. The company is now operating steam-driven plants in a most unsatisfactory manner, the greater project of using water power not having been carried out.

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Of the many important projects that have been launched in South Africa in recent years, none has been more ambitious than the undertaking of the Victoria Falls & Transvaal Power Co., Ltd. As the title implies the company was originally floated to supply the great Witwatersrand gold-mining industry with electric power generated at the Victoria Falls of the Zambesi River, which are about 600 miles from Johannesburg. These falls were discovered in 1855 by David Livingstone. They represent one of the greatest natural storehouses of energy on the earth. The company which conceived this ambitious project was registered in Rhodesia in 1906. It was promoted by the African Concession Syndicate and it acquired the preferential right to develop 250,000 h.p. at the falls and the exclusive right to sell such power in the Transvaal.

Early Opponents of the Victoria Falls Project

At the time of the flotation of the Victoria Falls Power Co. much criticism was directed against the scheme by responsible engineers. It was contended that while generation of electrical energy at the falls and transmission of such energy to the Rand was scientifically practicable, the project was predoomed to commercial failure. It was argued that the loss over such a great length of transmission line would strangle the undertaking in its infancy, that the cost of such transmission lines would be excessive and the expenditure invested in effectively controlling them would be enormous. Moreover it was pointed out that there were no large industrial plants on the route to the gold field nearer than Johannesburg to which power could be supplied and so relieve the financial strain on the company. It was also contended that it would be an unwise policy on the part of the miners to place the whole gold-mining industry at the mercy of one company whose source of energy was hundreds of miles away and whose transmission line would be subject to risks unknown in more civilized and more temperate countries, risks for instance in connection with elephants (these animals have pulled down more than one telegraph line in South Africa) and violent sub-tropical thunderstorms.

A Change in Policy

With a view to investigating the commercial possibilities of the undertaking the promotors of the Victoria Falls Power Co. enlisted the services of some of the prominent consulting electrical engineers of the day, among them eminent Continental professors and Ralph E. Mershon, of New York. Soon after the formation of the company the directors announced their intention of erecting a steam-driven plant on the Witwatersrand at the outset of the company's career, the greater project of obtaining power from the Zambesi being indefinitely postponed.

Previous to the visit of the British Association to South Africa in 1904, no electric power distribution schemes of magnitude had been carried into effect in South Africa, and some of the learned and technical members of this association remarked that it was surprising to find no large electric-power company in such a concentrated zone of industrial activity as the Witwatersrand. Shortly afterwards, however, details of the Victoria Falls power scheme were announced and simultaneously other projects were commenced. The firm of H. Eckstein & Co. began to work out the details for a large central power company, at the same time Lewis & Marks engaged in a full consideration of the advantages of Vereeniging on the Vaal River and close to important coal fields, as a site for a large power distribution station. Vereeniging lies about 40 miles distant from Johannesburg as the crow flies. For some time much rivalry existed between these companies and the relative disadvantages of each were assiduously advanced at meetings of technical societies and in the columns of the press.

Harnessing of Victoria Falls Abandoned.

After much negotiation, however, the Victoria Falls Power Co. absorbed the other undertakings, and proceeded to enlarge greatly the scope of the project and with a commendable honesty changed the name of the concern to the Victoria Falls & Transvaal Power Co. Of the Victoria Falls project it is not proposed to say anything further in the course of this article. The project of obtaining power from the Zambesi River has been shelved for an indefinite period and the present-day power-supply problems of the Transvaal are concerned with local steam-driven stations only.

The Victoria Falls & Transvaal Power Co. retains preferential right to develop a quarter of a million horsepower at the Zambesi but it will probably be a long time before that right is exercised. At the commencement of its career, the Victoria Electric Power Co. acquired the plant and property of the General Electric Power Co. at Driehoek close to the famous Simmer & Jack Proprietary mine and about eight miles from Johannesburg, and also the Rand Central Electric Co. at Brakpan, 19 miles from Johannesburg in an easterly direction. Previous to the acquisition of the power company the former concern was owned by the Consolidated Gold Fields of South Africa, Ltd., and the latter by A. Goerz & Co. Subsequently the building of a large electric and compressed air station was commenced at Rosherville, (about six miles east of Johannesburg) and the Vereeniging power site was acquired from the African and European Investment Co. Some idea of the magnitude of the undertaking of the Victoria Falls & Transvaal Power Co. may be gained from the fact that the authorized debenture and share capital is £6,000,000. The transmission lines are in operation from the West Rand Consolidated to Brakpan and Modderfontein, a distance of between 50 and 60 miles. The compressed-air transmission lines have been completed from one end of Central Rand to the other and the Victoria Falls & Transvaal Power Co. and the Rand Mines Power Supply Co. have jointly secured licenses from the Union of South Africa government permitting the supply of power up to 11,000,000 units annually.

General Use of Electricity on the Rand.

Electricity is now being supplied throughout the Witwatersrand for mining and metallurgical practice. Above ground electric current is employed for main winding engines, air compressors, electric locomotives, stamp batteries, tube mills and crushers. Below the surface it has been applied to electric winding engines for hauling ore on the incline of the reef and to pumps; it is also extensively used for lighting. It might be said that European practice in regard to the application of electricity to mining has

been eclipsed in South Africa. The enlargement of the scope of operation of the Victoria Falls & Transvaal Power Co. has been rapid and remarkable. The company is now in possession of four erected stations and one in course of erection which is practically completed. The stations and their capacities are as follows: Electricity, Rosherville station, five sets of 10,000 kw. each; Vereeniging, four sets of 10,000 kw. each; Simmer Pan (Driehoek), six sets of 3000 kw.; Brakpan, two sets of 3000 kw. The compressed-air plant at Rosherville consists of four sets of steam-driven air compressors of 4000 hp. each. Of these the Rosherville, Simmer Pan and Brakpan stations are completed and that at Vereeniging is nearly completed.

Results not up to Anticipations

There can be no doubt of the fact that so far the operations of this vast power project have resulted far from satisfactorily. Hundreds of thousands of pounds have been spent on machinery, buildings and transmission lines and further large sums have been sunk for power-station sites, technical advice, salaries, etc. The position today is that the power company is heavily mulcted for fines imposed on account of its inability to fulfill contracts while many of the mines have had to recommission their steam plants.

In recent months there has been a marked tendency for Rand working costs to rise rather than decline and a decline of at least 9d. or 10d. per ton in working expenditure was confidently anticipated as a result of purchasing power from large central power-supply companies. Scarcity of native labor has contributed in some degree to the augmentation of running expenditures, but it is held that the inability of the power company to supply sufficient power by stipulated dates has been mainly responsible for the increase in the cost of operation. Great inconvenience and expense have, of course, resulted to the mines and it is a matter for congratulation that the old steam plants have been maintained in good running order as standbys.

The truth of the matter seems to be that the power company has engaged to carry out larger contracts on specified dates than the power stations were in reality capable of; that the company has seemingly abandoned the policy of maintaining a reserve of power in case of emergencies and has, in fact, taken unwise and impolitic risks. The position has been further aggravated by climatic influences. During the rainy season, September to April, the Rand is subject to violent thunderstorms and it is held that these have adversely affected the operations of the company. Much, it appears, remains to be learned about the climatic conditions in regard to transmission of power. It may safely be remarked that the conditions prevailing in the southern Transvaal and at this altitude, taken altogether have not fallen within the experience of electrical engineers in other parts of the world. It has been argued that the company committed errors in erecting overhead wires. These have been practically unavoidable as underground cables are not yet reliable at 40,000 volts pressure.

Many companies having contracts with the Victoria Falls & Transvaal Power Co. have recently changed over to their old steam plants because of the inability of the power company to supply sufficient current. Of course this has meant considerable expense and inconvenience to the mine and has at the same time seriously reduced the earnings of the power company. The whole question of future working is now being carefully gone into. The Marquis of Winchester, chairman of the company, has been visiting Johannesburg and has been in almost continual consultation with the heads of the industry. The East Rand Proprietary Mines setback has rather tended to overshadow all other matters relating to the Witswatersrand, but the position with regard to the electric power company is recognized as serious and everything possible will be done to relieve the situation. It is reported locally that an understanding has been arrived at between the mines and the power company, and that the whole question of penalties incurred by the power company in the past and the better supply of electricity in the future has been amicably settled.

Mines of the Vladivostok District, Siberia

By Albert Bordeaux*

The Vladivostok district has the advantage over the other districts of Siberia in being near the sea, permitting the shipment of products that otherwise could not be profitably produced.

The alluvial gold belt extends northward only to the Tumnine River. The production for 1909 was 126 kg. and for 1910, 34 kg., produced from about 77,000 tons of gravel. The smallness of the production is due to the fact that the gravels of most of the rivers along the coast have been exhausted, but since 1910 gold has been found in the tributaries of the Ussuri River, such as the Iman and Bikin, and there are good prospects of a revival of the industry of gravel washing. Moreover dredging is possible along the shore of the Okhotsk Sea and Americans are said to be interested in such an enterprise.

*Mining engineer, Thonon-les-Bains, France.

Small Production from Quartz Mines

There is a quartz vein on Askold Island, a short distance from Vladivostok. This vein has been mined for 30 years and the total production is said to amount to about 850 kg.; in 1909 it produced 16 kg., and in 1910, 6 kg. Gold-bearing pyrite associated with arsenic and antimony minerals is found at Sedimi and Odimi in the vicinity of Vladivostok. These ores are refractory but are amenable to treatment by the chlorination process after roasting.

The principal discovery of rich zinc ore, calamine, was made by me in 1903, at Tetinhe, 250 miles north of Vladivostok and 22 miles from the seashore, but it was only after the Russo-Japanese war that the mine could be put on a working basis. The production from 1907 to 1911 was 55,000 tons; the ore contained 43 to 44% zinc and was worth $20 per ton at the mouth of the Tetinhe River.

Lead Mines Worked for 200 Years

The most important deposit of lead and silver ore is one that adjoins the calamine deposit at Tetinhe. It is a contact deposit between limestone and porphyry. Tests are being made with the view of erecting a concentrator and, perhaps, a small smeltery. A premium is paid by the government of $20 per ton of lead produced. There are a dozen similar but smaller deposits that outcrop in the neighboring valleys and if all are mined together a large lead industry may be built up in the future as was the case at Nertehinsk where several hundred mines were worked for 200 years.

The principal deposit of copper ore is in the Djighit Valley; it is a quartz-chalcopyrite vein in andesite. A premium of $60 per ton is paid by the government for all the copper produced. There are two deposits of magnetite between Olga and Vladimir Bays. Chromium and manganese deposits are known, but have not been exploited; platinum is found in the beds of certain rivers.

Coal and Lignite Deposits Are Worked

Lignite deposits are mined at a distance of 25 miles from Vladivostok; 200,000 tons being produced annually. Coal seams are also worked on Sakhalin Island, the mines extending in a line 80 miles long. The coal contains 70 to 85% carbon and in heating power is considered to be equal to Cardiff coal, but unfortunately there is no good harbor on the Sakhalin coast. Petroleum is also found on this island, but not enough work has been done to determine its value. Several other deposits of coal are known and mined, one of which is mined by the government, the production being from 120,000 to 200,000 tons per year.

Rolling Mill No. 2 Shaft, Michigan

By P. B. McDonald*

An 8x8-ft. raise was driven from the 630-ft. level to surface in five months by nine miners, three on each 8-hr. shift. They did their own timbering and trammed the rock 750 ft. Stoping, air-feed, hammer drills were used in raising and are now being used to enlarge the shaft to 12x14 ft. The latter work is proceeding downward from the surface.

*Mining engineer, 102 West Main St., Negaunee, Mich.

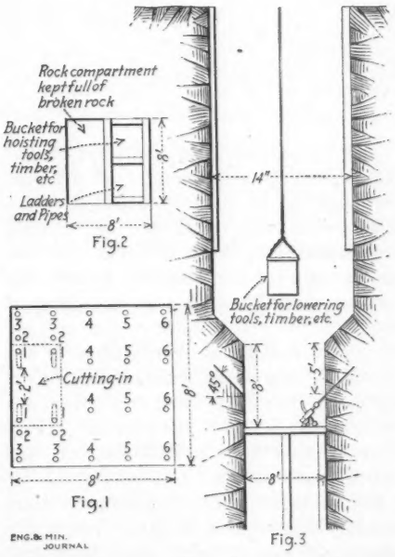
Considerable interest is manifested by Michigan iron men in the No. 2 shaft of the Rolling Mill mine at Negaunee. The shaft was started from the 620-ft. level last autumn and was raised to surface in five months by nine miners, three working on each 8-hour shift; they did their own timbering and trammed all the rock 750 ft. to shaft No. 1. The difficulties of raising so great a distance were successfully overcome, and no accidents or long delays were encountered.

Enlarging Raise from Surface Downward

The raise driven to surface was 8x8 ft., and this is now being enlarged to 12x14 ft., by working down from the surface, permanent timbering being put in at the same time. In this work of enlarging, the same rock drills which were used in raising are employed; this application of stoping, air-feed, hammer drills to the work usually done by heavy reciprocating drills, is uncommon and is accomplished by using 45° holes from below, to lift a 5-ft. cut, with the length of holes so gaged as to make the shaft of the required dimensions. On May 1, enlarging had been in progress for about two months, and the finished shaft was down 260 ft.; it was planned to take five months for raising and five months for finishing the shaft, and this schedule will probably be beaten. The work is under the direction of Capt. E. N. Cory, who has charge of underground operations at the mine for the Jones & Laughlin Company.

Arrangement of Holes

Fig. 1 shows the arrangement of holes for blasting, in driving the 8x8-ft. raise. The four holes numbered 1 are the cutting-in holes and the lengths of fuse were cut so that these would go first, and as nearly together as possible; the distance between the bottoms of the cutting-in holes was generally about 2 ft. The four holes, numbered 2, would go next, and these were given a small angle toward the cutting-in holes in order that their bottoms would not have too much to break. Holes No. 3 went next, and these completed a clean opening across the raise. In succession holes 4, 5 and 6 were fired, breaking easily into the opening made by the cutting-in holes and holes Nos. 2 and 3. All the fuses were lighted at once, the succession of explosions being regulated by comparative lengths of fuse, as it was not convenient for the men to fire the cutting-in holes and then to return to insure that these had broken before firing the others, as is sometimes done in drifting. The rock for the most part was jasper, with occasional streaks of schist, dipping at rather a steep angle to the vertical; the ground, however, usually broke evenly, and little allowance was necessary for the dip. The arrangement of holes in the sketch shows 24 holes, for the usual cut; sometimes in hard ground more holes were needed to help the cutting-in holes, while in soft ground it was possible to break the cut, using three holes each in sets Nos. 4, 5 and 6, instead of four holes.



RAISE AT ROLLING MILL MINE, MICHIGAN

Driving the Raise

Sketch No. 2 shows the method of cribbing the 8x8-ft. raise, which was done by the miners. One 4x4-ft. compartment was used for a bucket for hoisting tools, timber, etc., for which purpose there was a small hoist at the bottom of the raise in a station cut for that purpose. The other 4x4-ft. compartment was used for ladders and pipes. The ventilating current came up one 4x4-ft. compartment and went down the other, the fan for this purpose being stationed at the foot of shaft No. 1, 750 ft. away; the reason for placing it so far away was to insure getting pure air. The 4x8-ft. compartment was used for broken rock and was kept full, thus holding the cribbing firm. After blasting a cut, the miners trammed about 30 cars of rock from the rock compartment, drawing it off through a chute on the 620-ft. level. This took about three hours, by which time the powder smoke would be gone and the men could go up to the face for timbering.

Just before blasting, a platform of 10-in. timber, squared on two sides, was laid across the two 4x4-ft. compartments, at an angle to deflect the falling rock into the rock compartment. A small opening was left in the 10-in. platform to permit the man who lit the fuses to escape through the raise. About four-fifths of the broken rock from the explosion fell into the rock compartment, because the cutting-in was placed over the rock compartment and the material shot directly downward, and the ground broken by holes Nos. 4, 5 and 6 was thrown sidewise toward the cutting-in.

The surface soil was but a few feet thick over the shaft site; this was cleared away, but practically no sinking was done to meet the raise. When about 15 ft. below the rock surface, a smaller size raise was driven up a short distance, and drill holes put up and loaded heavily with powder, which, when fired, broke the raise through.

Enlarging the Shaft

Fig. 3 shows the unique method of enlarging the shaft, by which the same stoping air-feed hammer drills that were employed for raising, were utilized. These drills are butterfly valve, 2-in. cylinder, Ingersoll-Rand, B C 21 machines. The holes are put in at an angle of 45°, which is enough slope to allow the rock chippings to fall out. The length of the holes is so gaged as to make the enlarged shaft of the proper dimensions, and the rock usually breaks satisfactorily; only occasionally is it necessary to put in a pop shot, after a blast, to even up the walls. In such a case, the ordinary practice of placing holes is to use down holes, drilled vertically, perhaps 3 ft. apart. These holes could be drilled by reciprocating machines, mounted on tripods or long bars, or could be drilled by small plug drills, with hollow steel for blowing or washing out the rock cuttings. The objection to using reciprocating machines and tripods or bars is that they are heavy to handle in getting out of the way for blasting; also down holes often cause trouble in getting the rock chippings out. The last argument

applies to the use of plug drills as well. It is probably faster drilling, per foot, with air-feed hammer drills at a 45° angle, with the rock chippings falling back out of the way, than to drill down holes with their liability to give trouble from drill steel getting stuck.

The footage to be drilled, using 45° holes to enlarge an 8x8-ft. opening to 12x14 ft., is probably less than with vertical holes. The platform made by putting timbers across the top of the cribbing gives a convenient place for the men to stand. Furthermore, the air-feed hammer drills were at hand, ready to use, and the same nine men that drove the raise are now enlarging the shaft with the same drills. The broken rock is trammed to shaft No. 1 by trammers. There is a little trouble in the shaft at present, due to an unusual flow of water, much of which comes from the spring break-up on surface. Carbide lamps are found to be more reliable than candles. Washington fir is used for the permanent timbering.

Transvaal Mining Notes

JOHANNESBURG CORRESPONDENCE

At six of the Rand mines the residues from 2.5-dwt. sand average 0.40 dwt., and at six mines the total extraction is 96%. Slime residues from decantation run from 0.2 to 0.37 dwt. The sand residues at the Knights Central assay only 0.28 dwt., and at the Village Deep, 0.3 dwt. The Butters filter residues at the Robinson assay only 0.12 dwt. Owing to a bad season, the native-labor supply is improving this year.

The wages and salaries paid to white employees on the Witwatersrand during 1911, totaled £8,226,499, made up as follows: £764,153 to technical staff and medical officers; £382,167 to clerical staff; and £7,080,179 to employees as wages.

The Messina Copper Mine, in which Camp Bird, Ltd., acquired a large interest, is working on a small scale at present, and last quarter exported 461 tons of concentrates, assaying 34.5% copper.

BENONI MILL TREATING SAND ONLY

It is definitely announced that the slime-treatment portion of the Way-Arbuckle plant, at the Benoni mill, is a failure. The 32 agitators were designed to treat a mixture of sand and slime, but owing to the failure of the screw conveyors of the slime-settling cones, all the slime is now being stacked untreated and the agitators are treating sand only with an extraction described as fair. No provision was, however, made for any interruption in the power supply, which is a bugbear of most continuous treatments. Consequently when any stoppage of electrical or air supply takes place, the pulp in the agitators settles, and has to be dug out and the solution and half-treated sands dumped out before operations can be continued. Mr. Bosqui has been commissioned to report and will doubtless recommend the installation of a Butters filter plant. The mine ore reserves equal 522,671 tons of 6.8 dwt. ore with 446,675 tons of 3.5 dwt. at present unpayable.

The Van Ryn Deep ore reserves total 600,000 tons, assaying 7.17 dwt. A Butters slime filter is on order for the reduction plant to be erected on this mine. The ore reserves on the Witwatersrand mine, one of the first to start milling on the Rand, total 1,225,084 tons, assaying 5.65 dwt. The once rich Glencairn mine is now making small profits by mining the remaining reserves of 925,000 tons of ore, having a recoverable value of 3.5 dwt. per ton. A little development remains to be done.

The alluvial diamond fields, near Klerksdorp, produce about $30,000 worth of diamonds per month from the labor of 6000 to 7000 diggers. The occurrence of diamonds is exceedingly erratic; some diggers make fortunes and many recover no stones at all. The diamonds are found in widely scattered surface gravels, which are probably the remains of deposits made by the Vaal River.

TIN-MINING SITUATION

The Groenfontein tin mine has ceased milling, owing to the failure of the pipe ore deposits at present exposed. The total profits were £132,000, and capital expenditure £60,000. A 350-b.hp. gas engine is installed here, burning bituminous coal successfully, with a consumption of only 1¼ lb. per b.hp.-hr. The surface detritus is now being hydraulicked to win tin and to search for pipes. The ore reserves in the Zaaiplaats tin mine are 30,500 tons of 4.5% metallic tin. This mine produces 150 to 160 tons of concentrates per month.

The reserves in the Rooiberg tin mine are 21,000 tons of 4.5% tin. A new 20-stamp mill and dressing plant have just been completed. The adjoining mine, Leeuwpoort, has just been floated, after development work showed 67,325 tons of 2.27% tin, valued at £235,000, allowing for 80% extraction. The reefs are proved on the incline to 600 and 400 ft. in depth. It is estimated that the Swaziland alluvial tin deposit can still produce 30 tons of concentrate per month for 10 years.

Chrome Ore Production

The production of chrome iron ore for actual delivery in the United States during 1911 was 120 long tons, according to the U. S. Geological Survey, coming from Tehama, Siskiyou and Shasta counties, California. It is stated much more was mined than delivered, including some from Converse County, Wyoming. There were importations amounting to 37,540 tons of the ore, beside some chromic acid, and potassium bichromate. The chief uses are for refractory brick, pigments, tanning and in alloys.

The most important producers are New Caledonia and Rhodesia. Other important deposits are in Asia Minor, Russia, Greece, Canada, India and Japan. Chrome-iron ore is widely distributed through areas of serpentine and associated rocks, in the Appalachians, Rockies, Sierra Nevada, Coast and Cascade Ranges, but only occurs locally as workable deposits.

Mine Valuation*

BY J. R. FINLAY†

The central ideas, which I suppose are generally adopted by mining engineers in their conception of the value of mines, are due to H. C. Hoover. One of Hoover's main propositions is that a mine is a limited deposit of valuable ore, and that to make the greatest profit from it requires that the deposit be worked out rapidly. The main factor in this proposition is the time value of money; not only the money tied up in the investment, but of the money to be returned by the investment.

HOOVER'S THEORY IS TO MINE QUICKLY

It follows that the true interest of a mine owner is not to perpetuate an income, but to complete a job; not to prolong the life of his mine, but to shorten it by exhausting all profitable ore and getting the money into something else just as soon as economy will permit. Good economy, by Hoover's theory, demands that the ore reserves be ruthlessly slashed by getting out the best ore first, in preference to poorer ore, there being no logical reason why any absolute profit should be sacrificed in order to make a showing of stability.

These conceptions are rather shocking to the average investor, with whom stability of earning power is a kind of fetish. Such a man will understand the proposition easily enough, but he is bound to realize the technical character of the mining business and is pretty sure to distrust his limited knowledge of its details. Hoover's style of reasoning is strictly for mining men, or at least for men in a position to appreciate the real facts about a mine. Moreover it was proposed in the first instance to apply only to gold mining—a form of enterprise from which some of the ordinary com-

*A paper read at the meeting of the New York section of the Mining and Metallurgical Society of America, May 16, 1912, as an introduction to the discussion of the valuation of mining properties.

†Consulting mining engineer, 52 William St., New York.

mercial factors have been eliminated because gold can always be marketed without limit at a fixed price.

Commercial Data Important

Those of us who have inbibed these principles, of course understand that the mere annual income of a mine may mean very little in the problem of estimating its total value. We want to know the facts about the ore. We want to know how much profit is already assured and how much is the ultimate possibility. It then seems reasonable to believe that the real value of a mine lies between a certain minimum and a certain maximum. I fully believe that mines can be reasonably valued in this way. I am not able to see any reason why a mining engineer should not expect to understand commercial facts, and it occurs to me to point out the great importance of strictly commercial data.

Certain dopesters, whom we mining engineers may hastily call commercial quacks, often assure us that the valuation of mines by mining engineers is a cold, pale, and spiritless calculation, which is like poisonous gas to vital enthusiasm and will surely kill any enterprise that breathes it. We are perhaps disposed to grow indignant at these sneers, but I think we are forced to admit that the valuation of a mine, or the valuation of anything, depends on a number of factors in regard to which opinions of equally competent men are pretty sure to differ. There are plenty of cases in which strictly commercial questions, such as the price of a commodity or the value of money, or perhaps the mere demand for securities, or the value of some commercial strategic point, may outweigh the importance of the ore reserves.

A mining engineer may be at quite a loss as to how to weigh some of these facts, and his idea of value may be inferior to that of men who consider only commercial conditions. Furthermore, people attach enormous value to things which any hard-and-fast scheme of appraisal must leave quite out of the reckoning. Look at city real estate, for instance. Nearly all of it, unless built upon and utilized, is held at a great annual loss instead of a profit. Much of this land never will be utilized for any profitable purpose, but one would be foolish indeed to call it worthless. The fact is that it can be sold and it is always possible to borrow money on it. It seems to me that undeveloped mineral lands must be valued exactly as unused real estate is valued—at so much an acre, according to the prices fixed by mere trading. There is apparently no other basis.

Many Factors Involved

When we come to going concerns, I have always assumed that we have a series of factors as follows: (1) The average cost of the product. (2) The average price of the product. (3) Variations introduced by temporary fluctuations in prices. (4) The general tendency of prices in the long run. (5) The expected life of the mine. (6) The interest rate on invested money. It goes without saying that scarcely any of these factors is capable of being fixed with exactness. Of the whole list, the one factor which we generally consider to be the hardest to determine is the very one which is capable of being determined with the greatest exactness: I mean the amount of ore in a mine. While this is often exceedingly uncertain, we all know of instances in which it is absolutely measurable.

The average cost is not easily determined, and of this fact there are some capital examples in sight right now. The other factors are so uncertain that no two men will agree upon them. Take the question of probable prices for a given staple. All you have to go on are the facts of the past, and upon these it is almost always possible to put contradictory interpretations. Even past averages of prices apply only to a given term of years, and for each separate term you will get a different average. To project calculations into the future from this unstable base line is dangerously near pure guess-work.

Price of Product Important

What I think we sometimes forget is the enormous importance of the guess. In innumerable cases a difference of 10% in the price of the product will make more difference to the value than any possible uncertainty about the life of the mine. This applies to every kind of a mine except a gold mine. I have a case in hand now, a very important mine earning well over a million dollars a year. It is surely good for 10 years' life, and I believe that it is good for 20 years. If it lasts 20 years this mine will be worth say, $12,000,000; if it lasts only 10 years it will be worth $7,500,000. If, however, the price of its ore falls 11% it will be worth only $7,500,000 if it lasts the full 20 years. If, on the other hand, the price rises 11% it will be worth well over $10,000,000 with 10 years' life. You will observe that the differences in the price are no more than two men might readily disagree about. For instance, it is a difference about equal to that between 13½c. copper and 15c. copper.

How often do we stop to consider these most evident facts? Here is a little difference, well within the possibilities, which is more important than six or seven million tons of mighty good ore. There are a number of other variables, one of which is the value of money, but I shall not attempt to discuss them. My point is that in trying to place values upon mines we should be very cautious not to overestimate the importance of purely technical information.

Globe and Phoenix Report

Johannesburg Correspondence

The annual report of the Globe & Phœnix Gold Mining Co., Sebakwe, South Rhodesia, for 1911, shows that 71,802 tons were milled for a yield of 114,576 oz. of fine gold. The working cost was 33s. 6d. per ton, and profit 102s. 4d. per ton. Working costs were adversely affected by a shortage of native labor and the refractory character of the ore. The net profit for the year amounted to £321,-293, and dividends, totaling £290,000 were declared. The capital of the mine is £200,000 in 5s. shares, and it has produced £2,611,907 since its inception, and the main shaft has reached a depth of 2672 ft. on the incline. A fine-grinding plant, equipped with grinding pans, a roasting plant of Edwards furnaces and a cyanide plant are being erected to deal with the large accumulation of refractory residues.

The ore reserves are estimated at 178,-582 tons, of a gross value of £1,372,581, approximately a similar tonnage and value to that estimated in 1911. A disturbed area has encroached 80 ft. on the richest portion of the oreshoot in the 19th level, and shares fell heavily in value during the year. The total length of pay oreshoots in the mine is about 1000 feet.

Chinese Tin and Antimony

Neither tin nor antimony is found in North China, writes Consul-General Knabenshue, of Tientsin (*Daily Cons. and Trade Reports*, May 28, 1912). Antimony is found in western Central China, and tin there and in the extreme southeast. The trade routes for their export are by the Yangtze and the West Rivers. The total exports of antimony regulus in 1910 were 152,077 piculs of 133⅓ lb. each, divided as follows among the various ports: Changsha, 133,550; Yochow, 15,624; Hankow, 2418; all others, 485. There were 108,716 piculs of pig tin exported in 1910, divided as follows among the exporting points: Mengtsz, 102,465; Wuchow, 4276; Canton, 1176; Hankow, 625; all others, 184. Although Consul Julean H. Arnold, of Amoy, believes that there is a bright outlook for opening large antimony mines near there in the future, neither antimony nor tin is mined near there at present.

PERSONALS

Mining and metllurgical engineers are invited to keep The Engineering and Mining Journal informed of their movements and appointments.

Herbert K. Scott has left London for Newfoundland on professional business.

George E. Farish, after a brief trip to New York, has returned to South Porcupine, Ontario.

Prof. J. C. Gwillim, of the School of Mines, Kingston, Ont., is on the British Columbia coast.

Willis Lawrence is general superintendent for the Chosen Mining Co. at Yeng Byen, Chosen.

J. Parke Channing made an address at Houghton, Mich., June 5, before the Copper Country Club.

Charles Camsell, of the Geological Survey of Canada, is in the Similkameen district, of British Columbia.

D. F. King, formerly manager for the Vane syndicate, has been appointed manager of the Achilles mine, Porcupine, Ontario.

J. I. Hoffman, of Hoffman & Johnson, London, England, is at present in Servia in connection with several mining propositions.

Victor G. Hills, of Hills & Willis, Denver, Colo., left last week for professional work in the Yukon Territory, Canada.

Hon. Richard McBride, premier and minister of mines for British Columbia, has returned to Victoria from a visit to England.

Prof. James M. Macoun, of the Canadian Department of Mines, has been created a companion of the Order of St. Michael and St. George.

J. M. Ruffner, of Cincinnati, has commenced the season's hydraulicking on the North Columbia Gold Mining Co.'s placer gold leases, in Atlin camp, B. C.

William Leckie has been chosen president of the Lathrop Coal Co. and the West Virginia-Pocahontas Coal Co., to succeed W. A. Lathrop, deceased.

Howard Poillon has just returned to New York from a two months inspection of the vanadium bearing deposits of New Mexico, Arizona, Colorado and Utah, in the interest of clients.

J. W. Bryant lately returned to Victoria, B. C., after having spent the winter in Windy Arm district, southern Yukon. On June 1 he left for Toronto, Ont., on his way to London.

Sidney Lang has been appointed engineer of the Naumkeag Copper Co., near Houghton, Mich. He is engineer of the General Development Co. and had charge of the geological survey of the mine.

George Watkin Evans, of Seattle, Wash., left June 5 for the Ground Hog coal field in the northern part of British Columbia. He will spend the summer making a thorough examination of the field.

Charles E. Mills, now general superintendent of the Detroit Copper Co. and in charge of the Phelps-Dodge interests at Morenci, Arizona, has been appointed general manager of the Inspiration Consolidated Copper Co., and will take charge early in July.

Howard W. DuBois, of Philadelphia, on May 25, left Prince Rupert, B. C., for Hazelton, Skeena River, to go thence along the line of the Grand Trunk Pacific Ry. to Tete Jaune Cache, and from there south to the Quesnelle Hydraulic Gold Mining Co.'s placers, in Cariboo district.

Frederick M. Chase, recently general superintendent of the Lehigh Valley Coal Co., has been elected vice-president and general manager of the company, to succeed Samuel D. Warriner, who resigned to become president of the Lehigh Coal & Navigation Co. Mr. Chase has a longer record in the service of the company than any other officer. He came to it as an office boy, 30 years ago.

OBITUARY

Dexter B. Chambers, secretary of the Stewart Iron Co., Cleveland, O., and a pioneer steel man, died June 10, at Cleveland. He was 83 years old. Mr. Chambers was born in New York, and went to Ohio when a young man. He was connected with Brown, Bonnell & Co., at Youngstown, O., for a number of years before going to Cleveland.

John C. Searight, 40 years old, drowned in the Niagara river at Buffalo, on June 8. He had retired a few months ago from the superintendency of the Northern furnaces of the Republic Iron & Steel Co., Youngstown. Mr. Searight began as a chemist and blast-furnace superintendent in the Pittsburgh district and after several years was transferred to New Castle as superintendent of the Carnegie furnaces, which position he held for 14 years. About three years ago he resigned to accept the position with the Republic Iron & Steel Co., retiring from active business eight months ago.

Alexander Hill died in London, April 24, aged 55 years. He was born in Scotland and educated at St. Andrews and Glasgow universities. He served successively with the Tharsis Sulphur & Copper Co. and the Rio Tinto Co. in Spain; at El Chico in Mexico; in Portugal and in California. He was for some years in partnership with G. D. Delprat, now well known in Australia. In 1905 he formed, with C. H. Stewart, the firm of Alexander Hill & Stewart, in London. The firm were consulting engineers for Le Roi No. 2 Ltd., at Rossland and for the Van Roi Mining Co. in the Slocan district, B. C. As consulting engineer Mr. Hill visited British Columbia several times.

Samuel P. Lewis, superintendent in charge of the railmaking, structural steel and sheet-steel piling mills of the Lackawanna Steel Co., Buffalo, died at his home in that city June 10, aged 56 years. He had been engaged in making iron and steel all his adult life and was regarded as one of the best authorities on railmaking in this country. He was born at Aberdare, Wales. His father was one of the first ironmakers to come to America from Wales, and the son followed his calling and was employed with the Illinois Steel Co. or its predecessors for 30 years, advancing through the different mill departments until 1905, when he accepted a position with the Lackawanna.

Societies and Technical Schools

American Institute of Mining Engineers—The Spokane local section will hold a meeting at Republic, Wash., during the last week in July. From Republic the party will proceed to the Boundary district of British Columbia, to visit the respective mines and smelteries of the Granby and British Columbia Copper companies.

Kentucky State University—A practical mining course has been added to the College of Mines and Metallurgy. It began June 10 and will continue until Aug. 2, and is intended especially to give practical instruction to miners, mine foremen and managers. The course is under the direction of C. J. Norwood, dean of the college, assisted by professors H. D. Easton and T. J. Barr. The subjects included are coal mining; mine gasses and testing: explosions and fires; mine surveying and map drawing; use of mine rescue apparatus.

Lake Superior Mining Institute—The seventeenth annual meeting of the Institute, will be held in the Copper Country, with headquarters at Houghton, Mich., Aug. 28, 29 and 30. Arrangements are now under way and an interesting meeting is assured. Members are invited to prepare papers for this meeting, and forward the same to the secretary as soon as possible, so that copies can be printed and mailed in advance. This will give an opportunity for more thorough discussion. The subject of "Mining Methods" on the various ranges presented at the last meeting should be further taken up, so that in time all the ranges in the Lake Superior district will be covered. Attention has been called to the subjects of "Uniform Mining Laws," "Workmen's Compensation Law" and "Safety Appliances," which should be taken up in special papers. Further circulars will be issued later, giving list of papers, and other information. A. J. Yungbluth, Ishpeming, Mich., is secretary.

Editorial Correspondence

From our Representatives at Important Mining Centers

San Francisco

June 12—The South Eureka Mining Co. has initiated at the South Eureka and Oneida mines, in Amador County, the undertaking to solve the problem of disposing of the tailings from the mills in a manner to prevent damage to the farm lands in the vicinity, and in the hope that it will preclude any further complaint from the farmers. The South Eureka is well situated topographically for this purpose, as there is a natural depression where the tailings can be safely impounded. It is perhaps better situated in this respect than is any other mine in the county. There is evidence of disposition on the part of other mining companies to follow the example of the South Eureka, and to make such provision as is possible for disposing of or controlling the tailings. There is a diversity of opinion, expressed by the farmers, as to the effect of the detritus from the quartz mines. While it is known that crops have been successfully grown on land made of the tailings when a little scientific knowledge has been exercised, there are still farmers who declare that the detritus is not a fertilizer. The flooding, of course is not damaging to the land, and it is quite certain that quartz tailings, after disintegration and mixing with the natural wash of the soil, are a valuable aid to the productiveness of farm land. But the farmers complain. So the easiest way to remedy the supposed evil is to take care of the tailings, until the farmers progress to the point of knowing how to make advantageous use of them.

A tour covering the Real, San Diego, Sierra and Capital highways was started from San Francisco on June 10, in four touring cars. This tour was undertaken to demonstrate to the state engineer, the highway commission and others interested in the highways project the advantages of a continuous highway encircling the lower half of the state. An ultimate result of such a route will be to aid several mining districts that without it would likely remain unnoticed by investors for a long time. The passenger automobile is the forerunner of the auto truck. Both require much better roads than are demanded by horse teams. The mining districts that would be especially benefited by the adoption of the proposed route by the state highway commission, lie along the Sierra in Inyo, Alpine and Mono Counties. Eldorado would also be largely benefited, though that county is not in such need as Inyo and Mono, which are cut off by mountains on the west and by the desert on the south. The tour is conducted by W. G. Scott, a mining engineer of Bishop, and superintendent of the Treasure Hill mine in Mono County, will occupy about three weeks and cover about 1500 miles.

Denver

June 13—Dr. Victor C. Alderson, president of the Colorado School of Mines, announces that the new experimental ore-dressing and metallurgical plant, built for the school at Golden at a cost of $125,000, will be opened July 1. The plant, when fully equipped, will consist of four units, sampling, concentration, cyanidation and a fourth devoted to roasting and special apparatus, such as magnetic and electrostatic separators, dry tables and flotation schemes. Its facilities will also be available to experts who desire to make their own investigations. Floor space has been reserved for testing new devices. An inventor who wishes to perfect his invention can have the facilities of power, water, floor space, and ore supply at slight expense. While intended primarily for the use of the school, its advantages will be extended to those engaged in the solution of problems connected with ore dressing and extraction.

Plans for the building were drawn by Frank E. Shepard, president of the Denver Engineering Works. They were passed on by D. W. Brunton and Philip Argall, and mining engineers in all parts of the country gave suggestions. Finally, a reward of $50 was offered to the graduate who would make the best suggestion for improvement. This prize was won by Wallace A. Stephens of the class of 1898. The plant is in charge of Prof. F. W. Traphagen, director, and William G. Haldane, manager. Since the work done for individuals and companies will be charged for at reasonable rates, the plant will not interfere with private enterprises of a similar nature.

The largest amount ever awarded by the Federal Court has been given to the Smuggler-Union company in the Telluride district, in its suit against the Liberty Bell mine for removing ore from the claims of the former company. The amount claimed was $600,000 and the amount given by the court was $400,000. The basis of the suit was disregard of the apex law. Bulkeley Wells is president and general manager of the Smuggler-Union.

In the Paradox Valley region the uranium-vanadium interests are busy. The American Vanadium Co., owner of a mine in Peru, the Standard Chemical Co., and the General Vanadium Co., have bought claims and have been shipping test lots of ore. The Crucible Steel Co. has also purchased claims there. The Primos Chemical Co. is operating its mill at Newmire, Colo., and is turning out a good product. A large body of vanadium ore has been opened in new ground.

The *Herald-Democrat* gives the following Leadville production for May: From the Waterloo shaft, Carbonate Hill, the lessees sent out a little more than 1000 tons. From the Star properties 4000 tons of ore were shipped during the month. The Iron-Silver Mines Co. shipped 4000 tons, not including the tonnage shipped by leasers from the different properties of the company. The tonnage from the Yak tunnel was about 11,000. From the South Evans section fully 3000 tons were shipped from the different properties. From the Penn mines, Breece Hill, 4500 tons were sent out; from the Ibex, 7000 tons of all classes of ore were shipped. With these figures as a basis, fully 60,000 tons of ore are being hoisted per month throughout the district. Ore shipments from the Leadville station of the Denver & Rio Grande R.R. to valley smelteries and various zinc plants show a gain of 16,400 tons for the first five months of 1912 compared with the same period in 1911. It is asserted that the average gain for the Leadville district in ore output, of 1912 over 1911, is 25 per cent.

Butte

June 12—In the last 10 years, the Georgetown district has produced about $5,000,000, and this was done with poor transportation facilities, rough wagon roads with long hauls having been the only means of getting the ore out. The fact that construction of the extension of the Butte, Anaconda & Pacific R.R. into the district is actually in progress will bring the district into the foremost ranks of producing camps, as there are many low-grade prospects there, requiring only cheap transportation to make them mines. The effect of the new conditions is already being noticed by the inquiries being received from outside men, and some important transactions in mining property are being negotiated at present.

W. H. Sheets, a farmer, living near Silesia, in Carbon County, in drilling for water on his farm has found natural gas, which burned to a height of 15 ft. The drill had attained a depth of 107 ft. when the gas began to flow in such quantities as to stop operations. A number of years ago, two wells were sunk in this district, to a depth of about 750 ft., and a small amount of gas has been flowing from them ever since, although in nothing like the quantities noted this time.

The 1600-ft. level of the Mountain View mine of the Anaconda, has been opened from the airshaft only, but some excellent orebodies have been encountered and are being drifted on with such good results, that it has been determined to make it one of the principal working levels; a crosscut is now being driven from the workings to connect with the main hoisting shaft, after which electric motors for hauling ore will be installed. The machine shop on the surface, which is of brick, is being torn down and will be replaced with a steel-frame building.

The development of the Butte & Superior from a copper mine to a producer of zinc has been of absorbing interest to many mining men, and may mean much for some other mines in the district and for the camp as a whole. Underground operations have been extended to the 16th level and zinc ore continues to be opened. The new mill is said to be operating satisfactorily, and to be producing unusually clean tailings.

Salt Lake City

June 13—Improvements recently made at the Utah Copper Co.'s Arthur mill include coarse-crushing equipment, coarse rolls and gyratory crushers, new conveyor belts, Garfield roughing tables, classifiers, etc. The Nissen stamps have been replaced by rolls and Garfield chilean mills. These are larger and have higher sides than the ordinary chileans. The product from the roughing tables is classified in Janney-Richards classifiers, and the coarse product sent to the chilean mills. The new Janney-Richards classifiers have been running about two months. Additional transformers have been installed. Ten of the remodeled sections are running and the 11th and 12th are practically completed, the latter being over half finished. Work has not been started on the 13th section and it is not known when this will be changed. Between 5000 and 6000 tons per day are being treated. The reservoir of the Arthur mill has been cleaned out to free it from the accumulated slimes, etc. There is an experimental plant in which a new 12-deck Wilfley slime table is being tried out. New feed tanks have been added in the Magna mill, which is treating between 10,000 and 12,000 tons per day.

A number of improvements are being made at the Garfield townsite for the employees of the mills and smelteries. Five or six new brick terraces are being built, and ground is being broken for 18 bungalows. There are no frame houses, the buildings all being of concrete and brick. Two new switch engines have been received by the Bingham & Garfield R.R. to be used about the mills, for switching concentrates, etc. Grading on the branch line of the Bingham & Garfield R.R. to the American Smelting & Refining Co.'s sand pits near Saltair, has been practically finished and track is being laid. This sand will be used in banking up some of the reverberatory furnaces. There are five reverberatory and two blast furnaces in operation at present. Two of the reverberatories have been equipped for burning California crude oil as fuel, and are giving satisfactory results.

During May, the U. S. Assay Office at Salt Lake received gold and silver bullion worth $126,339. This is approximately 10% greater than usual. In April, bullion worth $65,771 was received. The total business for the first five months of the year amounted to $550,643, or over $110,000 per month. The total receipts in gold and silver bullion, since the opening of the office three years ago, have amounted to $3,792,115, making over $100,000, average monthly receipts.

Negaunee, Mich.

June 15—Drilling still continues in the region west of Republic. The Oliver Iron Mining Co. has a drill in the Fence Lake country, in Sec. 5, T. 46-R. 31, and one on Sec. 1, T. 46-R. 31, but the latter drill will probably be moved to the vicinity of Fence Lake soon; the Oliver camps have been moved westward to be nearer to the drills. The Jones & Laughlin Co. is still operating two drills on Sec. 30, T. 47-R. 30, south of the old Magnetic mine; this property, owned by the Norman Iron Co., was platted for a townsite a number of years ago, and a series of legal entanglements arose when the Jones & Laughlin Co. took the option to drill. In the Cascade district, the E. J. Longyear drills on the Kirkpatrick lands, near the village of Palmer, are still at work with three crews, while drilling continues on the Heidelbach lands, at the eastern end of the range.

The valuation of the Brotherton iron mine, on the Gogebic Range, in Michigan, was recently reduced from the high figure given it as a result of the appraisal by J. R. Finlay. The reduction is from $954,000 in 1911 to $400,000 in 1912, the reasons for the change being arguments presented by Pickands, Mather & Co.'s representatives, as to quality and amount of ore in the mine. At the same hearing, the mining company asked for reductions in valuation of their Sunday Lake and Mikado mines, but were refused. All three mines are situated at Wakefield, Gogebic County.

Toronto

June 15—The action of the Canadian Government in temporarily remitting one-half of the duty on imported cement is strongly opposed by the Canadian cement manufacturers. In the JOURNAL of June 15, the cement situation in western Canada was outlined in these columns. Some of the smaller independent companies state that they will have to close down, as they cannot compete successfully with the American plants, under the reduced duty. The effect of the remission was apparent immediately in the sending of large orders from the principal western cities for supplies of American cement. It is understood that the government's action is not necessarily final, as Hon. W. T. White, Finance Minister, is still engaged in an investigation of the whole question, including the matter of freight rates and car shortage; also that the future policy of the government as regards the tariff on cement will be determined by the result of his inquiries.

Cobalt

June 15—Several Cobalt mining companies are again agitating for a reduction of the heavy royalties which they have to pay. The City of Cobalt pays 25% of the net profits to the Temiskaming & Northern Ontario Ry. Commission. The Chambers-Ferland pays the same royalty to the Ontario Government, and the O'Brien pays 25% on the gross output. It has always been felt by the companies that such royalties were excessive and it is now believed that relief may be granted. The Chambers-Ferland company has never paid a dividend and the City of Cobalt has not paid one for two years.

The decrease in production of Cobalt mines is evidenced by the falling off in shipments of the Kerr Lake and Crown Reserve. For the first six months of the present year, the Kerr Lake has shipped 310 tons of ore, as against 733 tons for the corresponding period of 1911. Over the same periods the Crown Reserve has shipped 210 tons, as against 492 for last year. While a considerable part of this decrease may be attributed to the larger amounts of bullion produced and the smaller shipments of low-grade ore, the fact remains that both of these companies are producing less silver than they did last year.

Recent discoveries in Gowganda seem to have given that district a new lease of life. There are now three producing mines, the Mann, Millerett and the Miller Lake-O'Brien. These companies are in better shape than they ever were before, and all have larger ore reserves than at any time in their history. The construction of the railroad into Elk Lake has caused some revival of interest among the owners of mining properties. Mining in this section, however, offers small chance of any return.

The Mining News

The Current History of Mining

Alaska

Prospectors are beginning to outfit for the Port Wells region; the snow is going rapidly as the amount of snow is less than usual and the weather fine.

W. A. Dickey, of Landlocked Bay, is working a crew of about 15 men. His ore reserves are increasing constantly. He has lately built a wharf and will probably soon be one of the regular shippers of copper ore from this district.

The principal activity is in the Shoup Bay district, where the Cameron & Johnson, Bence & McDonald and the Rambler mines are being developed with crews of from 5 to 20 men each. The tunnel on the Bunker Hill property shows a vein from 6 to 24 in. wide for about 150 ft. The ore runs from $5 to $100 per ton.

Midas—E. F. Gray is examining this copper property, across the bay from Valdez, with a view to acquiring it.

Yukon Gold—It is reported that the company has acquired extensive interests in the Iditarod district.

Schlosser—Ore has lately been struck on this property, on Fidalgo Bay. The conditions had been rather unpromising there for a time, previous to the late discovery.

Blakeney—It was reported recently that the managers of this property, on Fidalgo Bay, will soon install an aërial tram, and begin shipping ore.

Three-in-one—C. E. Campbell, representing English men, is making an examination of this property, near the Cliff mine, with a view to purchasing. The mine is a low-grade property, with a large vein, and is now under lease to the Heckey brothers, one of whom is an owner.

Arizona

Gila County

Superior & Boston—The company is shipping to the Old Dominion smeltery about three cars per week of ore reported to average about 8% copper. The ore is coming from the stope below the sixth level on the Great Eastern vein. A crosscut has been started south toward the Limestone vein, opened through the Limestone shaft to the third level. About 55 men are employed.

Arizona Commercial—At the Copper Hill shaft the west drift on the fourth level has reached the boundary and connections made with a drift from the Gray shaft of the United Globe mine of the Old Dominion. Work is concentrated on the enlarging of the shaft to three compartments, working upward from the fourth level.

Black Warrior—The lease of P. S. Tate and the Lyle brothers on the first level has expired and the mine is being worked by the owner, the Warrior Copper Co. Development is in progress on the fifth, or lowest level. E. M. White is manager.

South Live Oak—Churn-drill hole No. 1 is still at about the 640-ft. mark, no progress having been made for two weeks because of serious caving and the loss of the tools in the hole. The tools have been recovered and casing will be put in; it is expected that drilling will be resumed within two or three days. The last 40 ft. have been in soft, altered granite, carrying considerable copper carbonates, and some chalcocite is reported.

Southwestern Miami—Churn-drill hole No 5 is 680 ft. deep in schist formation. Hole No. 6 is 545 ft. deep and is in schist. A string of tools is lost in the hole, which is being enlarged with a 10-in. under-reamer, preparatory to driving the casing before attempting to recover the tools. Hole No. 7 is in conglomerate and is 305 ft. deep. Hole No. 8 is 100 ft. deep in schist. None of the holes is yet in ore.

Inspiration Consolidated—The sinking of one of the new three-compartment working shafts has been started, and a headframe and hoisting equipment will soon be erected. The spur from the Arizona Eastern R.R. to the millsite and mine has been located. Grading for the concentrator is expected to start in about a month. Three of the development shafts are being sunk to greater depth and the ore is being blocked out for mining. Additional boiler and compressor capacity are being provided at the portal of the main tunnel, after which the underground force will be increased. W. H. Aldridge is at the mine.

Gibson—This mine, nine miles west of Miami, is shipping about three cars of ore per month to the Old Dominion smeltery. The ore is reported to average about 16% copper. Ten cars of ore have been shipped since the Gibson Copper Co. resumed the working of the mine in February. About 20 men are employed.

Keystone—Hole No. 52 is being drilled. Henry Krumb is making an examination of the mine for the Inspiration Consolidated Copper Co.

Santa Cruz County

Chief—This mine next to the World's Fair has been bonded for $60,000 to the Calumet & Arizona company.

Texas—M. M. Trickey is shipping from this property of the Duquesne company, on a lease with a royalty of 50 per cent.

Lafayette—McCarthy & Sheehy have optioned this group to the Copper Queen company.

Sonora—Pollock & Sheuat, representing Bisbee men, are shipping carbonate copper ore.

Volcano—Richard Farrel has bonded this group and some other claims to the Calumet & Arizona company. A great deal of work has been done upon this property and a good showing of ore made. The price is $100,000 distributed over two years.

Red Hill—The Copper Queen company is doing work on this property, on a speculative basis. The showing is attractive and deep work is expected to show ore.

Morning Glory—This property is shipping two cars of ore per week to the Pioneer smeltery. The owners of the smeltery have a bond on the group.

Pluto—Chapman & Crisman have taken over this property from A. C. Freeman and will work it. There is hematite cropping, that it is hoped may cover a copper deposit. This was worked and a smeltery built on the ground by Colonel Bean, some years ago.

Ivanhoe—The Copper Queen company has completed a thorough examination of this property with view to purchasing it.

California

Amador County

Following an address recently made by a representative of the Western Federation of Miners, several new members were added to the local union at Sutter Creek. There have been several attempts recently to revive the miners' union at Jackson. The Western Federation is not strong in the Mother Lode region. The skilled workmen are fairly paid and are generally contented. The unskilled labor in most districts is usually done by foreigners who do not seem to be in any special need of protection.

Butte County

A vein has been uncovered on the Crane ranch, near Oroville, which carries gold and copper ore. The occurrence of copper in this section is prob-

able, as it is in line with the southeast strike of the west side copper belt of Shasta County, that is also exposed in Nevada County. Whether copper may be found in Butte County, in commercial quantity, remains for the prospector to learn.

The organization of the Oroville Exposition Association has been completed for the purpose of erecting an exposition building. The exposition held several months ago served to attract unusual attention to the mineral resources of the county. S. N. Feldhein is president and George P. Morse is secretary.

CALAVERAS COUNTY

Gold Cliff—The caving of the rim of the open cut in which the hoist and the gallows frame are situated, is reported to have damaged the engine and to have carried several tons of rock and soil into the shaft. Definite information is not available, but it is not likely that a great amount of débris reached the shaft if the caving was on the hoist-house side. The mine was formerly worked by an open cut, 500 ft. long and 200 ft. wide at the top, and from 25 to 75 ft. wide at the bottom, at a depth of more than 150 ft. The engineer had stepped out of the house just before the caving occurred. No one was injured.

INYO COUNTY

Cerro Gordo—This property is reported to have been purchased by Utah men and will be operated by modern methods. The ore is a lead carbonate, containing zinc and silver. Shipments are being made regularly and are carried by an aërial tram to Keeler, for transportation by rail.

Independent Lead-Silver Mining Co.—The property is situated on the Inyo Range, 25 miles east of Keeler, and contains 400 acres. The ore is argentiferous lead, carrying some copper. Prospecting has been done with shallow shafts and several cars have been shipped for test runs. Two auto trucks have been purchased for hauling ore to Keeler. The auto road will be shortened to about 12 miles. S. H. Brady, of the West End Consolidated, has been appointed general manager and consulting engineer.

KERN COUNTY

The Pacific Crude gusher, which caught fire on June 2 and burned constantly for six days, has been brought under control and the fire extinguished. A strong wind lifted the column of burning oil away from the well and carried it 100 ft. high. All the steam from the temporary boilers was immediately directed against the mouth of the well, thus preventing further ignition. The wind drove the burning oil across the sumps and away from the well, and the flames were soon controlled and extinguished. The well continues to flow, and is pronounced one of the best prospective producers in the northern part of the field. It is 3252 ft. deep.

California Trona—The receiver is having a mineral survey made, and is putting the old plant in shape for experimental work.

LOS ANGELES COUNTY

Little Rock Power & Water Co.—A survey was made recently for this company's reservoir and pipe line, for the power plant. The dam will be 100 ft. high, with an upper length of about 400 ft. The pipeline and penstock will have a diameter of 22 in. under a head of 800 ft. in seven miles' distance. Power will be carried 60 miles over the Mohave desert to Randsburg, for use in milling ore at the Yellow Aster mine.

MODOC COUNTY

The snow is reported to be going off rapidly and the prospects are that the rush into the Highgrade district will increase. It is also reported that the Ft. Bidwell and the Sunshine mines will resume work on a larger scale.

NEVADA COUNTY

Champion—The 20 stamps began dropping on June 6, for the first time since the property was taken over by the North Star. Thorough and extensive development has been in progress for 1½ years. The mill is being fed from development ore in the 1600-ft. drift of the Merrifield shaft.

SAN BERNARDINO COUNTY

Horn—This property in the south end of the Turtle Mountains, has been examined by William Neagle, engineer, representing the United Verde. No definite information is given out as to the result of the examination.

SHASTA COUNTY

Heroult—Four cars of products of the new electric plant were recently shipped to San Francisco, one each of pig iron, tar, pitch and lime. This is the last car of pig iron from the first continuous run of the smeltery. New electrodes are being installed, and the horsepower will be increased from 1200 to 2000. Two more furnaces will be installed.

TUOLUMNE COUNTY

App—This mine has not been sold, as previously reported. The mine and 60-stamp mill have been closed indefinitely. There have been examinations made by prospective purchasers, the last of whom was the Tonopah-Belmont. Whether the negotiations are closed has not been definitely stated but there is no immediate prospect of a sale.

Black Oak—This mine is being operated by C. E. Knox, of the Montana-Tonopah company. The 20-stamp cyanide mill is said to be securing a 96% extraction. It was erected by the Trent Engineering Co., which is also installing a 100-hp. electric motor to run the hoist.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Newhouse—The 100-ton mill will be designed to treat ores by amalgamation, concentration and cyanidation.

Little Richard—The shafthouse, ore-sorting house and machinery of this company, in Soda Creek, were destroyed by fire recently.

Cully—It is reported that development work will be resumed at this tunnel and at the Alco mine. The company contemplates the installation of a new hoist and compressor. James J. Cully is manager.

Gem—A new steel and masonry shafthouse is to be built to replace the buildings recently destroyed by fire.

Mackey—It is reported that a rich strike has been made in this mine in the Apex district, on the 250-ft. level. The orebody is 6 ft. wide. George Pyle is superintendent and J. L. Mountz general manager.

LAKE COUNTY-LEADVILLE

Garbutt—The shaft is 950 ft. deep. The ore is found in a fissure vein and is a gold-bearing copper sulphide.

Western Mining Co.—In May the Carbonate Hill mines produced about 8000 tons of carbonate-of-zinc ore and the A. Y. & Minnie about 1000 tons of zinc sulphides.

Fairplay—Shipments of 18 tons per day are going out from this mine in Adelaide Park. The main orebody is 40 ft. wide and 14 ft. high, with an average grade of about $10 per ton. Small streaks of high-grade ore are being sacked and shipped separately.

Mt. Champion Mining & Tunnel Co.—Thirty-five men are employed and Manager Smith expects soon to start the new mill.

SAN JUAN DISTRICT

Gold King—Under the management of J. H. Slattery, associated with Otto Mears, the mine is operating satisfactorily under the leasing system. New Wilfley slimers will soon be added to the mill equipment. Railroad traffic will soon be resumed to Gladstone and the stored concentrates will then be removed and the mill pushed to full capacity. Slattery and Mears are also operating the Iowa under lease and have several months' ore supply there.

Intersection—This mill, as yet the only one operating on the eastern range, will enlarge to 30 tons, adding a Wilfley table and Frue vanner to its present equipment. An attempt will be made to percolate the coarse sands. This mill is the pioneer in the treatment of the ores of this range.

Frisco Tunnel Co.—The framework for the new mill at Animas Forks is being framed at Silverton and the mill is to be

installed soon. It will use chilean mills, classification and table concentration. It is the intention to make two table products, lead and zinc. Lack of iron will permit of table concentration without use of electrostatic or other treatment, it is claimed.

SAN MIGUEL COUNTY

Smuggler-Union—The machinery for the new mill is being installed and when completed a much larger saving on the ores from the lower levels will be effected and the mine probably operated more successfully.

Nellie—G. H. Hall, lessee, has increased his force to 17 men and will start the other five stamps of his mill.

TELLER COUNTY-CRIPPLE CREEK

Midget-Bonanza—A body of ore has been opened by Allen & Carr, lessees, and in the Gold Hill tunnel level an electric hoist has been installed to raise from a winze.

Doctor-Jack-Pot—Supt. Carl Evans has leased the ground on the new eighth level, south of the shaft on the Smith-Riley vein to Jerome Beard and two blocks north will be leased this week. Wilson Brothers, leasing the Ingham block, have opened a shoot giving them 100 ft. of stoping. It was struck 200 ft. below the Raven Hill tunnel. Thomas Bailey will ship soon from his lease on the Lucky Corner and F. C. Whitford has just shipped 40 tons of $25 ore.

Henry Adney—This company, operating on Beacon Hill, is considering the purchase of the Maid of Orleans, Little Joe, Chickenhawk and August Flower claims, undeveloped ground but in a rich territory.

Gold Dollar—The May output was 1495 tons, of a gross value of $23,220. Average grade was $15.53 per ton.

Ajax—In May the shipments were about 1000 tons of ore of an estimated value of approximately $30,000. B. Colburn is superintendent. The mine has been shut down pending alterations in the Clancy process mill.

Cresson—This mine, under the management of Richard Roelofs, is credited with a production in May of 2400 tons, worth about $25 per ton in gold.

Masterpiece—This company is developing a large dike by a tunnel into Big Bull Mountain. A 6-drill compressor is being installed.

Gaylord—The foundations of the mill on Bull Hill are about completed and the installation of machinery will commence soon. Supt. W. A. Reed thinks that by Aug. 1, the mill will be in operation.

Delmonico—A rich oreshoot is reported to have been opened at 1000 ft., in this mine on Bull Hill, by Hinds & Luce, of Cripple Creek, lessees.

Idaho

BLAINE COUNTY

Golden Glow Mining Co.—The 900-ft. tunnel on the Trapper claim has encountered the vein at a depth of 1200 ft., and work is progressing on the vein. The property is owned by Portland, Ore., men, and is managed by William Schultz.

Boulder Consolidated Mining Co.—The vein on the Red Boy claim has been opened at a depth of 350 ft. The company is controlled by Boise, Ida., men, and William Schultz is manager.

Independence Mining Co.—The new 100-ton concentrator was placed in operation, June 1, and is expected to run continuously for some time, as a quantity of ore is blocked out in the mine. The company is involved in litigation. H. J. Allen is manager.

COEUR D'ALENE DISTRICT

Federal—Harry L. Day, former managing owner of the Hercules mine, at Burke, has been elected president and general manager of this company, succeeding F. H. Brownell, elected chairman of the Federal board of directors. The Hercules tonnage practically gives the Guggenheim interests control of the smelting of lead ores from this district. W. Clayton Miller preceded Mr. Day as manager. Mr. Day developed the Hercules from a prospect to the point where $5,000,000 was refused for the mine within the last year.

IDAHO COUNTY

Welch Tunnel Gold Mining Co.—This company was organized in 1911, by Elk City men, to develop a gold mine, two miles from that place. Preparations are being made to install a mill to treat free-milling ores. R. Kemp Welch, Elk City, formerly in charge of the Idaho Champion Mining & Milling Co., is manager.

Michigan

COPPER

Ahmeek—The hoisting and surface equipment for shafts Nos. 3 and 4 is on the ground and is being assembled. Extensive openings are being made underground. Plans are being made for the enlarging of the stamp mill, which will be necessary to take care of the increased production from the new shafts. The mill was originally laid out with this in view, insomuch that the pumping facilities and boiler capacity are ample to meet future needs.

Isle Royale—It is reported that a search for the Kearsarge lode will be instituted soon, and that a crosscut will be started from No. 6 workings to look for the Baltic or West lodes.

Island Copper Co.—This company, organized several years ago, is said to be preparing for operations on its lands on Isle Royale. These comprise about 92,000 acres. Plans include extensive diamond drilling and it is unofficially reported that about $500,000 will be expended in this work. Thomas F. Cole and associates, are interested.

Osceola Consolidated—A small force of men is at work in shafts Nos. 5 and 6, making arrangements preparatory to regular production. These shafts have not produced since March, 1910, but during the intervening time have been overhauled and put in shape to handle an increased tonnage. It is believed that these two shafts will be producing at the rate of at least 500 tons of rock per day each, within a short time.

Hancock—No. 2 shaft, at 3660 ft., has entered a copper-bearing formation, which is believed to be the Pewabic lode, the objective point in sinking. Should this prove to be the case, lateral openings will be started on the formations that have been revealed in the opening of this shaft, and the property put on a producing basis.

Winona—This company is gradually increasing its underground forces, in order to increase production, but it is having difficulty in securing the desired class of workmen.

IRON

A crew of men is cutting the right-of-way for the Chicago, St. Paul & Milwaukee Ry. between Crystal Falls and Iron River; camps have been constructed and a steam shovel is expected.

Peninsula Power Co.—This Iron Mountain company, which is furnishing power to mines at Iron River, has let a contract for the erection of a substation at the latter place.

Lucky Star—In the sinking of this shaft 15 ft. of quicksand were encountered at 55 ft. depth. It was found necessary to move the temporary headframe to one side, with rollers, and to use the drop-shaft method of sinking. The timber sets are put in with no space between, and the structure sinks by its own weight, while men at the bottom of the shaft dig out the sand and keep the shaft straight.

American—At this M. A. Hanna mine on the Marquette Range, work has been commenced on the erection of the iron-ore concentrator by Contractor MacArthur, of Denver. Spiles have been driven and the framework started; the site is just north of the shaft; it is planned to have the concentrator finished and in operation by winter.

Bristol—Work on the steel headframe being erected at this Crystal Falls mine was recently delayed by a strike of the steel workers.

Cleveland-Cliffs Iron Co.—A diamond-drill hole has been started west of Negaunee and a short distance south of the Jackson school-house; it is on the lands formerly belonging to the Jackson Iron Company.

Montana

Butte District

Anaconda—At the Mountain View mine about 600 men are employed at present in the mine and on surface, and an average of about 1850 tons of ore per day is being hoisted. The airshaft has been sunk to a point 31 ft. below the 2000-ft. level and sinking has been temporarily discontinued to permit the cutting of a station on the 2000-ft. level; as soon as this is completed, crosscutting will be started on this level.

Elm Orlu—During the year ended June 1, 1912, this zinc and copper mine owned by W. A. Clark, situated just west of the Butte & Superior mine, was operated at a loss of $21,160. During that time 47,194 tons of ore were extracted at a cost of $6.14 per ton. Transportation costs were $92,226; ore treatment, $118,629. Construction amounting to $9659 was done, making $500,293 total operating costs, against gross proceeds of $481,133. Owing to the destruction of the concentrator of the Butte Reduction Works, where the Elm Orlu ore was treated, the mine has been closed down for the last six months, except for repair work.

Pilot Butte—The shaft on the Pilot claim is being sunk 80 ft. per month, and is now over 1100 ft. deep; it will be continued to the 2000-ft. level before more development is done. The old hoist formerly used at the Tuolumne mine, has been purchased and is being remodeled to a capacity for hoisting from 2500 ft. depth. About $123,000 have been raised among stockholders recently.

Broadwater County

Butte & Radersburg—The shaft has reached the 200-ft. level, and preparations are being made to crosscut to the veins, of which there are three outcropping on surface.

Deer Lodge County

During the winter some development work was accomplished in the Georgetown district, although owing to the poor condition of the roads, little ore was shipped. The roads are now in good condition and a season of much activity is predicted for this region. Many properties are beginning to ship ore to the Washoe smeltery at Anaconda.

Oro Fino—The mine orebins are full and the mine, managed by Charles Bostrom, will begin hauling.

Holdfast—Robert Lindberg, who is operating this mine under a lease, has obtained good results lately, and will be ready to ship ore soon.

Georgetown Placer—Supplies and lumber for an active season's work have been purchased and work will be started when they arrive. The company owns placer ground in the district and will do development work.

Baltic Combination—Surface quarters are being erected at the mine and development work will soon be started.

Fergus County

In the Cone Butte district, Vincent Gies and Herbert Jones began work on their claims a short time ago.

Hugh McIntyre is mining good ore in his mine, in the Cone Butte district, and has about a car of $100 ore ready for shipment.

Jefferson County

Baltimore—This mine near Boulder has been closed down by Jack Mulligan, of Butte, and Charles Whitcomb, of Helena, who have been operating it on a lease. They have been working there for some time and have taken out about 4000 tons of ore which brought a fair profit. B. E. Calkins, and others of Butte, own the property.

Madison County

Clipper—Edward Smith, of Pony, who is operating this old mine near that place under a lease, has made a strike on the 1800-ft. level. Twenty-five men are employed and the mine is shipping ore.

Nevada

Comstock Lode

Union Consolidated—North and south drifts have been started in the east vein on the 2500-ft. level, and both are in quartz. The vein is broken up where opened, and porphyry is mixed with the quartz. The east crosscut on the 2200 is in diorite.

Mexican—The new clarifiers in the mill are at work, and the result has been an increased tonnage and percentage of extraction. Eight bars of bullion, from the cleanup of one of the tanks, were shipped last week.

C. & C.—The new bearings for the Riedler pumps, on the 2000 station, are being fitted, and will permit these pumps to handle hot water direct from the deep levels.

Belcher—Development in a southerly direction on the 15-in. stringer, cut by east crosscut No. 4 on the 1400-ft. level, has been started.

Yellow Jacket—A car of concentrate has been shipped to the smeltery from a cleanup on dump rock, and run No. 7, on Crown Point ore, has been started.

Esmeralda County

Blue Bull—The installation of a new 40-hp. electric hoist has been completed and enlarging the 400-ft. shaft on the Hat claim of this company from 4x7 to 4½x9½ ft., is under way, preparatory to sinking to 600 ft. From that depth a crosscut west will be run to explore the Hat claim. K. M. Simpson is manager. The company is undergoing reorganization and will be known as the Reorganized Blue Bull Mining Co.

Florence—Superintendent Dewey has started a raise on the rich orebody struck several weks ago in virgin ground on the 250 level. A crosscut to tap the new orebody on the 350 level is also under way. About 100 ft. of crosscutting will be necessary on the lower level. New orebins have been constructed on the surface to facilitate the handling of the ore from the new strike.

Pittsburgh-Silver Peak—Manager Bradley states that the recent strike of miners is no longer a matter of concern. New workmen have been imported and operations are practically normal.

International Smelting & Refining Co.—The company has established a state agency office in Goldfield. F. M. Chambers has been appointed state manager.

Diamondfield Extension—Sinking has reached the 50-ft. point and a station is being cut preliminary to crosscutting east and west.

Nye County

Shipments in tons from Tonopah mines to date and for the week ended June 6, are as follows:

Mines	Week	Year to Date
Tonopah Mining	3,350	75,916
Tonopah Belmont	2,050	46,876
Montana-Tonopah	899	23,339
Tonopah Extension	1,035	22,167
West End	663	16,264
Midway	.....	180
MacNamara	470	8,195
North Star	.....	80
Totals	8,467	193,020
Estimated value	$211,675	.....

Tonopah-Belmont—The report for May states that the company milled 7956 tons of ore producing 261,197 oz. silver and 2650.33 oz. gold, the net profits for the month amounting to $125,646.

MacNamara—In May the company treated 2084 tons of ore, being 427 tons in excess of April; the net profit for the month was $8567.

Tonopah Halifax—At a depth of 1275 ft., a quartz vein carrying low-grade ore and dipping at 36 deg. was entered; the shaft has penetrated the vein for 36 ft. but has not yet encountered the footwall.

Montana-Tonopah—The production for May was 4611 tons of ore, yielding $47,614 in bullion and 54.70 tons of concentrates.

White Pine County

Giroux—The company is reported to have rented a traveling crane and clamshell bucket from the Nevada Consolidated and to be making increased shipments to the Steptoe plant. June shipments will probably include 100 tons of concentrates from the run made three years ago at the company's plant at Kimberly.

New Mexico

Grant County

W. T. Bryant intends to erect a 100-ton mill to treat the ores from his mine and to do custom work for other mines operating at Pinos Altos.

Dimmick—This silver mine is being unwatered.

Lucky Bill—Larsh, Ross & Co., of Silver City, recently purchased this mine from the Bryne-Wensley Mines Co., of Denver. The ore is lead carbonate and about 15 cars per month has been the production for a year.

Cleveland—The new machinery has arrived and will be erected soon. The usual shipments are being made. A car of ore and concentrates shipped recently is reported to have netted over $1300. Particular attention is being devoted to the zinc products.

Socorro County

Deadwood—A good tonnage of custom ore is being treated, delivered by four mines in process of development. A large ore reserve is accumulating in the mill.

Ernestine—The first 10-day bullion cleanup for June is being smelted.

Oaks—Fifty-five tons of ore were recently delivered to the Deadwood mill from a week's development at the Pacific and Johnson mines. Leasers have started work on the Susie and other mines.

Mogollon Gold & Copper Co.—One thousand feet of air pipe have been delivered at the Little Charlie tunnel and are being carried forward to the winze, which is developing one of the highest-grade orebodies in the district. The product is sent to the Deadwood mill.

New Jersey

American Smelting & Refining Co.—The strike of employees at the company's refinery, in progress for several days, was settled June 18. Slight concessions were granted by the company.

Oregon

Lane County

West Coast Mines—This property, near Orseco postoffice, is being worked, and an occasional brick is sent out. There are 30 stamps but only about 15 are busy. Power is furnished by an electric plant.

Mayflower—This mine is being developed and ore blocked out, and it is thought that the mill will soon be started. This mill was hauled in last summer. W. P. Eley, of Kelso, Wash., is manager.

Vesuvius—The buildings destroyed by fire recently will be replaced and development work done. Mr. Hard, manager, may put in an addition to the 10-stamp Hammond mill.

Utah

Beaver County

Granite Copper Co.—This company's King-of-the-Hills property is reported to have shipping ore in a winze from the upper tunnel.

Moscow—The usual output of three or four cars per month is being maintained, yielding returns of about $1200. Six teams are hauling ore.

Juab County

Victoria—Returns from two cars shipped recently were nearly $5000. Drifting is being done in several places on the 1200 and much development is in progress.

Eureka-Swansea Extension—The new electric hoist is ready for operation, and drifting to the east will be done on the 300-ft. level. Frank Nielson is superintendent.

Mammoth—The case brought by the company to prevent Werrett & Orton from shipping the old McIntyre mill dump is expected to come up for a hearing soon. An injunction was issued by Judge Marshall. Werrett & Orton purchased the dump, and shipped 3000 tons of the ore on which they made a good profit. There remain about 6000 tons, probably of the same quality. The company claims that the purchasers fraudulently misrepresented the dump's tonnage and obtained it at a low figure. The leasers deny this, and say that they paid the company the price asked, 75c. per ton, taking the company's figures with reference to the tonnage.

Salt Lake County

Bingham-New Haven—Shipments of copper and lead ore are being made, the former being sent to Garfield.

Utah Copper—The contract for electric power with the Telluride Power Co., which was taken over when the company acquired the Boston Consolidated, will not be renewed. The power plant at the Magna mill is expected to be enlarged to provide ample capacity for both plants.

Bingham Mines—Two shifts are sinking the Yosemite shaft, to connect with the Mascotte tunnel, which will give a depth of 2200 ft. on the incline from the collar. The shaft is down 800 ft. There has been a good production of both copper and lead ore above the 800 level of the Yosemite. The Dalton & Lark and Commercial mines are shipping between 100 and 200 tons of lead and copper ores per day. Earnings for April were approximately $14,000.

Utah Bingham—At a recent meeting the stockholders authorized the sale of the property to the New Utah-Bingham Mining Co., to be organized by the directors. Stock will be exchanged share for share.

Michigan-Utah—Several of the directors accompanied by a tramway engineer have made an inspection of the tram line from the City Rocks mine at Alta, the repair of which is being considered. This tram extends to Tanners Flat, three miles above Wasatch. A movement is being agitated to reconstruct the old branch of the Denver & Rio Grande R.R. up to this point. If the tram line is repaired it will probably be used to send out Michigan-Utah ores through the lower tunnel of the City Rocks. With proper transportation facilities the output of this company's mines as well as of other Alta properties could be largely increased. On the Big Cottonwood side about 20 tons of ore per day are being shipped. A 78-ton lot recently marketed averaged 0.035 oz. gold, 51.7 oz. silver, 21.9% lead, and 1.2% copper, bringing net smeltery returns of $41.30 per ton.

Ohio Copper—The annual meeting was held in Portland, Maine, June 5, but little concerning this meeting has been made public. About 2000 tons of ore per day are being mined and milled. The gross earnings are estimated at about $35,000 per month. A part of the company's indebtedness to the Stewart Mining Co. and Davis-Daly is reported to have been paid off.

Summit County

Park City shipments for the week ended June 7 were 3,533,720 lb. The Silver King Coalition, Daly West, Daly-Judge and New York Bonanza were the principal shippers. During May, the output of the camp was 7908 tons, which is higher than usual for this season of the year.

The new dam built by the Silver King Coalition, Daly-Judge and Daly West to hold tailings was placed in commission June 9. The water leaving the dam is clear of all tailings. The object was to divert the waters of Silver Creek to Richardson Flats so that the tailings, containing finely divided silver and lead, might be settled.

Daly-Judge—A new Richard-Janney classifier has been installed in the mill, and during the last 10 days the zinc middlings have averaged 43% zinc, as compared to a former rate of 25 to 40%. It is the best zinc middling that has been made by this company. Three of these new classifiers are in operation.

Silver King Coalition—It is reported that this property is being examined by English interests.

Little Bell—About 200 tons of ore are awaiting shipment. The roads are not yet opened.

Virginia

Zinn Iron Mining Co.—It is reported that this company has sold about 8000 acres of iron land in Rockridge and Augusta counties, to Pittsburgh men.

Washington

Ferry County

North Washington Power & Reduction Co.—This cyanide plant, which was designed to treat the ores of the Republic district, started operations recently with a capacity of 125 tons per day. H. W. Newton, Republic, is superintendent.

San Poil—The machinery for the new mill is in place and the mill about ready to start. This plant is smaller than the North Washington but is built along the same general lines.

Canada

British Columbia

Victoria—J. P. Swedeberg has uncovered copper ore on this property, near Nelson. The mine is situated on a contact between augite-porphyry and limestone; it gives indications of becoming a producer. A compressor is installed and an aërial tramway connects the mine with the Canadian Pacific Railway.

Venus—W. Poole and associates have taken over and will soon commence opreations on this mine, situated in the Nelson gold belt. The ore will probably be treated in the Athabasca mill. There are uranium minerals in both this mine and the Juno, but so far no attempt has been made to recover them.

Richmond—This property in the Rossland district is under bond to Joseph L. Warner. Work was conducted through the winter and a shaft started in March is over 30 ft. deep. Surface water has hampered work. Four men are stripping and prospecting surface veins.

Le Roi—About 100 tons per day are being hoisted to the Black Bear tunnel and trammed to the ore bins on the Great Northern Ry. The ore is shipped to the smeltery at trail over the Canadian Pacific Railroad. Work is steadily progressing at Le Roi No. 2 mine.

Emerald—The company is installing a 4-drill compressor. This is one of the silver-lead properties, situated near the Sheep Creek gold belt, and has shipped steadily for some years.

Mother Lode—The company has had trouble with the tube mills, owing to faulty gearing. An auxiliary compressor is being put in for aëration and agitating purposes.

Ontario

Dryden Prospecting Syndicate—This company, in the Dryden district, has ordered a Davis Calyx core drill, from the Canadian Ingersoll-Rand Co., Ltd., capable of sinking 300 ft. and bringing up a core of 1¾ in. diameter.

Asbestos Corporation of Canada—A company, in process of organization under this title, of which W. G. Ross will be president, has taken over the assets of the former Amalgamated Asbestos Corporation.

Ontario—Cobalt

Shipments of ore and concentrates, in tons, from Cobalt for the week ended June 14, and for the year to date, are:

La Rose	85.70	1,577.25
Coniagas	.....	889.82
O'Brien	31.25	294.49
Right of Way	.....	148.60
Chambers-Ferland	.....	225.60
McKinley-Darragh	24.55	1,233.55
Nipissing	84.30	985.58
Hudson Bay	31.60	344.22
Buffalo	32.20	507.72
Crown Reserve	25.85	236.11
Cobalt Townsite	54.95	591.73
City of Cobalt	.....	145.84
Trethewey	.....	241.04
Colonial	.....	41.60
Kerr Lake	30.37	350.03
Cobalt Lake	38.65	246.06
Drummond	.....	318.77
Temiskaming	.....	416.87
Beaver	.....	187.89
Wettlaufer	.....	111.21
Provincial	.....	22.22
Casey Cobalt	43.85	68.35
Totals	484.27	9,062.04

Bullion shipments in ounces

Nipissing	80,315.12	1,741,456.81
Crown Reserve	7,998.00	215,201.00
O'Brien	10,495.71	98,928.72
Wettlaufer	3,032.00	3,032.00
Miscellaneous	63.75	16,322.56

Bellellen—Work is to be resumed on this South Lorrain property.

Beaver—During the three months ended May 31, 1244 ft. of drifting, crosscutting, sinking and raising were done, also 1076.5 sq.yd. of stoping. Results were satisfactory. The main shaft is 590 ft. deep. It is stated that a large tonnage of mill ore is blocked out. From Mar. 18 to May 31, 3786 tons of ore were milled, at a cost of $1.88 per ton, producing 67.83 tons of concentrates averaging 1244.8 oz. silver per ton. Extraction percentage was 84.4; total value recovered, $43,907; net profit of mill, $36,895. The mill is exceeding its designed capacity of 50 tons per day. The Erie Cobalt property, 40 acres, has been purchased for $1500, to conserve water for milling purposes. Cash balance, May 31, was $55,-829, with $83,873 due from smelters.

Boyd-Gordon—It is stated that this Gowganda property is under option to the Mann mine, adjoining.

Ophir—Development is meeting with encouraging results.

Nipissing—During May the high-grade mill treated 175 tons of ore and shipped 298,973 oz. of silver. Good progress is being made with the low-grade mill. A large part of the concrete work is in and the framework of the buildings is erected.

Chambers-Ferland—The annual statement shows cash in bank and accounts receivable, $196,750; royalties, $17,606; balance, $179,143.

Cobalt Central—This property is being operated by the Pennsylvania-Canadian Co., and a quantity of good milling ore has been blocked out.

Cobalt Lake—A good quality of milling ore has been found on the 225-ft. level. The vein was picked up some time ago by a crosscut from No. 6 shaft.

John Black—Operations are being conducted by the Peoples' Silver Mining Co., of Montreal. The vein encountered in the winze, 100 ft. deep, from the crosscut on the 200-ft. level, runs from 4 to 16 in. of calcite and niccolite, but assays have been disappointing.

Casey Cobalt—This company has shipped a car of 43¼ tons of ore, which carries, according to sample, 216,336 oz. of silver, worth $132,235. This is said to be the richest car of ore ever sent from Northern Ontario.

Ontario—Porcupine

Little Pet—This property may be reopened soon.

Hollinger—The time for subscribing to the issue of 50,000 shares of treasury stock expired June 10, most of the shareholders taking up their rights at $10 per share.

Hollinger Reserve—The main shaft is being sunk to the 100-ft. level.

Dome Lake—A new plant is being installed.

American-Porcupine—A contract will be let for considerable diamond drilling.

Moneta—The shafthouse has been destroyed by fire and the underground workings flooded.

Standard—This mine has been closed down.

Miller Lake-O'Brien—In addition to high-grade ore, a good tonnage of milling ore is being developed at the 250-ft. level.

Donaldson—A strike of high-grade ore has been made at the 100-ft. level of this Elk Lake mine. The shaft has been in milling ore all the way down.

Crown Chartered—The shear zone has been cut at the 200-ft. level, over 100 ft. from the shaft. Over 800 ft. of underground work have been done at the 100-ft. level, which has disclosed many quartz veins.

Swastika—A vein of good ore has been cut on the 400-ft. level, about 26 ft. from the shaft. Its width has not yet been determined. It has been decided to install a 10-stamp mill.

Mexico

Jalisco

Compania Minera La Union—Neil Trumbull and H. K. Taylor have organized this company, to operate copper properties in the Ameca district.

Mexico

Esperanza—In May, 19,099 tons of ore were crushed. Total receipts were $95,-800; expenses, $80,891; estimated profit, $13,632; development, 846 ft. Further openings on the San Carlos vein disclosed ore from 2 to 4 ft. wide, assaying from $8 to $45 per metric ton.

The Market Report

Current Prices of the Metals, Minerals, Coal and Mining Stocks

Coal Trade Review

New York, June 19—There is very little to be said about the coal trade in the West, which continues about on the same lines as last week. The Seaboard coal trade also continues dull but there are prospects of improvement as the accumulated stocks at tide are being worked off and New England buyers are beginning to come forward. Anthracite trade is a little more active but dealers and large consumers are still holding back and hesitating about putting in stocks. The collieries are reported to be working at about 85% of capacity. Steam sizes are in a little better supply; in fact there is said to be some accumulation at the storage yards.

Coal passing through Sault Ste. Marie canals, season to June 1, short tons:

	1911	1912	Changes
Anthracite	266,822	17,848	D. 248,974
Bituminous	1,792,324	1,653,022	D. 139,302
Total	2,059,146	1,670,870	I. 388,276

The decrease this year was due to late opening of navigation and to the anthracite mining suspension in April and May.

The Southwestern Interstate Coal Operators' Association reports shipments as follows for the two months ended Feb. 29, in short tons:

	1911	1912	Changes
Missouri	429,030	587,212	I. 158,182
Kansas	812,074	1,039,049	I. 226,975
Arkansas	225,030	331,876	I. 106,846
Oklahoma	422,158	616,713	I. 194,555
Total	1,888,292	2,574,850	I. 686,558

Total increase this year was 36.4%. These shipments cover over 90% of the coal mined in the states named.

The Hocking Valley Cases—At Toledo, O., June 11, the United States district court announced a fine of $42,000 upon the Hocking Valley Railroad Co. and a fine of $20,000 upon the Sunday Creek Co., of Columbus, O., a coal concern, for violation of the law relative to rebating.

The case will be appealed to the U. S. circuit court of appeals, as this is the first time that the question as to whether the giving of unlimited credit on freight bills is in violation of the act has been heard in court.

Iron Trade Review

New York, June 19—Very little change can be reported in the conditions affecting the iron and steel markets. Mills continue busy with a prospect of plenty of work to carry them through the summer. Specifications on contracts are large and considerable new business is expected between now and July 1, so that the position is strong.

Steel-mill operations continue at the high rate recently attained and here and there production is even increased. The country is making pig iron at the rate of practically 30,000,000 tons a year, equal to the best average ever maintained for a twelvemonth, and well in excess of the best output in any calendar year. This high rate is due entirely to the activity of the steel-works blast furnaces, as the merchant furnaces are not operating at as much as two-thirds of capacity. Without the blowing in of additional stacks, pig-iron production is likely to decline in the next two months, on account of the usual weather conditions, but most of the steel works will close for a few days in July for repairs and this will probably maintain the balance. Rumors that the Steel Corporation is about to buy bessemer pig iron are not credited in well informed quarters.

The extreme shortage of labor is being still more commented upon. It is probably responsible for two or three little strikes which have occurred in the Pittsburgh district in the past few days. It is evident that no great increase in production or consumption of steel can occur in the near future, as there is no additional labor supply to make or utilize much more steel.

In pig iron demand seems to be increasing. Basic is actively called for in the Central West and the demand for foundry iron is improving. Several additional merchant furnaces have blown in. In Seaboard territory several of the large pipe companies are buying additional iron. A large part of this business has been taken by Virginia furnaces. Prices continue about the same, except that Alabama makers have been offering No. 2 foundry at 25c. below the $11.50 which was recently asked for that grade

The coke market continues steady and rather quiet, although some large contracts for furnace coke for the balance of the year have recently been closed.

Republic Iron & Steel Co.—This company will soon begin the construction of four new merchant bar mills at Youngstown, Ohio, to supplant certain mills of an obsolete type at the Brown-Bonnell and Mahoning Valley works. On completion of these improvements the Mahoning Valley works will be abandoned and dismantled and the complete rehabilitation of the Brown-Bonnell works as a modern steel plant will have been accomplished. In addition to the new finishing mills the company will construct at Haselton byproduct coke works of 1000 tons daily capacity. This plant when completed will place all Northern blast furnaces on substantially a self-contained basis for coke, and the waste gas generated in coking will largely supplant the coal now used for heating purposes in the finishing works at Haselton. The cost of the improvements has been financed, bonds to the amount of $2,000,000 having been sold.

Baltimore

June 17—Exports for the week included 660 lb. selenium to Hamburg; 8,680,500 lb. steel rails and 432,265 lb. track material to Tampico, Mexico. Imports included 2476 tons spiegeleisen, 1645 tons ferromanganese and 1838 tons manganese ore from Great Britain; 24,600 tons iron ore from Cuba.

Birmingham

June 17—The pig-iron market in the Southern territory is not so active as it has been and sales are not as frequent as the manufacturers would like to see them. The quotations are not as firm as they have been, sales being made at $11.25 per ton, No. 2 foundry, basis, and reports have it that this price is being lowered for delivery during the third quarter of the year. There is a strong feeling still manifested as to iron for delivery during the fourth quarter, and $11.50 per ton is asked. Very few sales are being made now for that period, though the books of the various companies will show that there is a fairly good tonnage placed. The steel situation in Southern territory shows no change. There is activity in fabricated steel and the rolling mills of the Tennessee Coal, Iron & R.R. Co., at Bessemer, are working on full time.

Scrap iron is in good demand. Brass foundries, machine shops and foundries are feeling a little impetus in their trades.

Announcement is made that the American Radiator Co. has purchased land, at North Birmingham, and will erect a big plant during the next 12 months. The company has a small plant here now, leasing a pipe plant which was converted into a factory.

A committee of Southern pig-iron manufacturers, consisting of J. W. McQueen, vice-president of the Sloss-Sheffield Steel & Iron Co., C. D. Bannister, of the Woodward Iron Co. and H. S. Chamberlain, of

the Chattanooga Iron Co., went to Washington the past week to confer with the Interstate Commerce Commission in reference to an early consideration of the petition of the Southern iron men looking to a lower rate on iron to the Ohio gateway points. The Southern manufacturers expect a reduction in the freight rates to the Ohio River product if the concession can be secured. No definite information was obtainable.

Chicago

June 17—The iron and steel market shows continued firmness for pig iron, despite light demand, and large sales of nearly all forms of manufactured products.

The requirements of the foundry melters, on whom this market chiefly depends, now are for small lots, frequently delivered. For last-half requirements in general, a few sales are being made; most of the business is for third quarter, in lots of a few hundred tons. Furnace agents quote $11.25, Birmingham, as the standard price for No. 2 Southern iron, and this means $15.60, Chicago; for No. 2 Northern iron, $14.25@14.50, at furnace, is asked. Some Southern No. 2 iron probably sells at $11 Birmingham and some for $11.50. For last-quarter deliveries, the furnace agents ask the higher prices. Summer dullness is apparently on the trade.

In manufactured products, the situation is highly promising for continued activity. Structural material is in larger demand for building and bridge work throughout Western territory, the price of material under 15 in. remaining 1.43c., Chicago. In railroad supplies there is increased activity, several large orders for standard rails having been placed, while light rails and track fastenings are in very good demand. Billets are still scarce at $28 for openhearth forging, though the demand is not large. Bars are strong and the mills are crowded with orders, with little seeking of new business; bar iron continues to sell for 1.25c. and soft-steel bars hold to 1.35c. Plates are in large demand for car-building purposes and sheets are strong.

Cleveland

June 17—Ore movement is heavy, but boats are finding some delays in loading at the upper ports.

Pig Iron—Business continues active, and some furnaces are pretty well sold up. Prices are a shade higher. Quotations are: Bessemer, $15.15; No. 2 foundry, $13.75; forge, $13.25, all Cleveland delivery.

Finished Material—Specifications continue heavy and mills are all busy. They are not at all inclined to shade prices to get business. Wire is the weakest spot in the market and structural steel the strongest.

Philadelphia

June 19—New business is pig iron has been chiefly in small lots, so far as foundry iron is concerned. There are some large inquiries, chiefly from New England, but the tendency of furnaces to ask higher prices has rather checked business. Basic is again the subject of negotiation, but forge is rather dragging. No. 2 X foundry is $15.25@15.50; basic $15.25; while $14.50@14.75 is asked for gray forge.

Steel Billets—A fair volume of small orders is coming in and prices are firm.

Bars—Less new business is coming in and the market is easier.

Sheets—The market is strong. There are inquiries for second half, but mills are not hunting new business.

Plates—The mills are busy and prices are firm. Inquiries are out for a good lot of plates for ship work.

Structural Material—Negotiations are on for several large lots, but business closed has been mainly for small orders. Prices are firmer.

Scrap—There has been more movement, especially in heavy melting steel. Dealers are generally confident, and not inclined to make concessions.

Pittsburgh

June 18—Despite the political excitement the steel market is giving a good account of itself. It is not improbable that were it not that the most strenuous convention of a generation is in session in Chicago there would be a distinct advancing tendency in some products, notably bars, plates and shapes. Several makers of these products are disposed to put up their prices, but do not regard the present moment as opportune. It is not unlikely that within a short time merchant bars will advance from 1.20c. to 1.25c. and plates and shapes from 1.25c. to either 1.30c. or 1.35c. The hoop market has gained in strength, and some contracts have been closed at 1.30c., although 1.25c. is still possible in some instances.

Pig Iron—The market is strong all along the line, although sales are relatively light. Nothing important has occurred in foundry iron since the purchases of 12,500 tons of third-quarter iron by the Standard Sanitary Manufacturing Co., noted in last report. It is believed that a little additional buying would force the market up. The Carbon Steel Co. is understood to have bought 6000 to 7500 tons of basic for second-half delivery, paying in the neighborhood of $13.25, Valley, and $13 iron seems scarcer than formerly, being available in any case only for early delivery. Bessemer has been quiet. The furnaces are exercised over the continued effort of Connellsville coke operators to secure $2.50 on second-half contracts, when expiring contracts are chiefly at $1.55@1.65. Last week some of the merchant operators curtailed production in order to force the prompt market to a level more in keeping with the demand for $2.50 on contract, but as very little prompt coke was called for the market did not respond to a great extent, and prompt furnace coke is quotable at $2.15@2.20. We quote pig iron as follows: Bessemer, $14.25; basic, $13@13.25; malleable, $13@13.25; No. 2 foundry, $13.25; forge, $13, all f.o.b. Valley, 90c. higher delivered Pittsburgh.

Ferromanganese—Imports have been light and the available supply of ferromanganese for sale is limited, but consumers appear to be well covered and are not inquiring for as much prompt material as formerly. There has been a little contracting for the first half of next year and a considerable tonnage of inquiry is out. We quote prompt at all the way from $50 to $55 and contract at $48.50, Baltimore.

Steel—There is less inquiry for prompt steel than formerly, but there is no surplus offered, some of the mills being behind in deliveries. The market is firm and we quote: Billets, $21.50; sheet bars, $22, f.o.b. maker's mill, Pittsburgh; billets, $21; sheet bars, $22, f.o.b. maker's mill, Youngstown. Rods are quotable at $24.50@25, Pittsburgh, but the stiffening tendency observed last week continues.

Sheets—Contracting for extended delivery continues in the case of a few lines and at full prices. The run of specifications on old contracts is very good, buyers being confronted with the prospect of unspecified tonnages being canceled at the close of this month, when many contracts expire. Mill operations are up to the limit permitted by the supply of steel and labor, and average a trifle over 90% of all the sheet capacity in the country. We quote: Black sheets, 28 gage, 1.90@1.95c.; galvanized, 2.95@3c.; blue annealed, 10 gage, 1.40c.; painted corrugated, 28 gage, 2.15c. per lb. and $1.35 per square; galvanized, 3.05c. per lb. and $2.55 per square.

St. Louis

June 17—The pig-iron market is steady, with business mainly in small lots. Southern No. 2 is quoted $11@11.50 Birmingham—$14.75@15.25 St. Louis—the higher figures being for second-half delivery. Northern No. 2 foundry is quoted around $15 for early deliveries. Finished material in fair demand.

Coke is quoted at $5@5.10 St. Louis for good foundry, with a sufficient supply.

Iron Ore Trade

The figures of the Cleveland *Marine Review* on dock stocks of ore at Lake Erie ports are as follows, in long tons:

Stocks on docks, Dec. 1, 1911	9,131,664
Stocks, May 1, 1912	5,881,245
Winter shipments to furnaces	3,250,419
Shipments May 1–Dec. 1, 1911	23,178,370
Total for the season	26,428,789

Stocks on docks, May 1, were 969,040 tons less than on May 1, 1911. The total shipments of Lake ore to furnaces through Lake Erie ports have been, for the years ending May 1, for 10 years:

1911–12	26,428,789	1906–7	30,099,769
1910–11	32,636,692	1905–6	28,984,358
1909–10	33,599,013	1904–5	20,057,070
1908–9	20,524,523	1903–4	18,739,995
1907–8	31,692,446	1902–3	21,905,251

The Lake Erie shipments will not vary far from 75% of the total Lake Superior ore.

Imports and exports of iron and manganese ores in Germany, three months ended Mar. 31, were, in metric tons:

	1911	1912	Changes	
Iron ore, imp	2,078,363	2,676,903	I.	598 540
Iron ore, exp	655,314	584,851	D.	70,523
Manganese, imp	80,919	107,176	I.	26,257
Manganese, exp	1,126	1,801	I.	675

Imports of slag and slag products in 1912 were 296,839 tons, an increase over 1911 of 148,795 tons; exports were 28,848 tons, an increase of 9436 tons.

Foreign Iron Trade

German Iron Production—The German Iron & Steel Union reports the production of pig iron in the German Empire in April at 1,427,559 metric tons, being 5182 more than in March. For the four months ended Apr. 30, the total make was, in metric tons:

	1911	1912	Changes	
Foundry iron	1,029,702	1,024,365	D.	5,337
Forge iron	194,080	182,072	D.	12,008
Steel pig	573,820	670,525	I.	96,705
Bessemer pig	118,186	122,257	I.	4,071
Thomas(basic)pig	3,191,599	3,543,291	I.	351,692
Total	5,107,387	5,542,510	I.	435,123

Total increase this year, 8.5%. Steel pig includes spiegeleisen, ferromanganese, ferrosilicon and all similar alloys.

Metal Markets

New York, June 19—The metal markets have been generally strong, but a little less active. The strikes at the copper refining works seem to be in a way of settlement.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal	Exports	Imports	Excess	
Gold				
May 1912	$ 4,450,899	$ 3,346,491	Exp.	$1,404,408
" 1911	6,817,149	5,014,741	Exp.	1,802,409
Year 1912	26,225,801	19,653,285	Exp.	6,572,516
" 1911	10,176,807	29,005,312	Imp.	18,828,505
Silver				
May 1912	6,725,781	4,345,032	Exp.	2,380,749
" 1911	5,054,304	3,555,842	Exp.	1,498,462
Year 1912	28,623,028	20,384,764	Exp.	8,238,264
" 1911	28,665,500	18,454,155	Exp.	10,211,345

Exports from the port of New York, week ended June 15: Gold, $587,623, chiefly to Cuba; silver, $846,652, principally to London. Imports: Gold, $400,011; silver, $211,434, largely from South America and Mexico.

Gold—The price of gold on the open market in London remains at the usual bank level, 77s. 6d. per oz. for bars and 76s. 4d. per oz. for American coin. Most of the supplies arriving went to the Bank of England. In New York there was a considerable shipment of gold to Cuba.

Gold production in the Transvaal in May was $16,115,614, an increase of $868,181 over April. For the five months ended May 31, the total was $65,266,621 in 1911, and $75,129,373 in 1912; an increase of $9,862,752 this year.

Iridium—The current price for this metal is $64 per oz., New York.

Platinum — The market continues rather quiet, but the price seems to be fixed at the same point which it has held for some time. Dealers ask $45.50 per oz. for refined platinum and $48 for hard metal up to 10% iridium.

Our Russian correspondent writes, under date of June 6, that the market is dull and inactive. There is no demand from abroad and in St. Petersburg for the last fortnight no business has been done. At Ekaterinburg the offer of platinum by the starateli increases; many miners have left the gold mines to work on the platinum mines. The quotations are: in St. Petersburg, 37,600 rubles per pood; at Ekaterinburg, 9.80 rubles per zolotnik. The prices are nominal and subject to negotiations. The prices are for crude platinum. 83% metal, and are equivalent to $36.85 per oz. in both markets.

Silver—The market has ruled steady the past week with fluctuations between 28 3/16 and 28 5/16d. Monsoon reports from India are good and prospects for silver are favorable. The market closes strong at 28¼d. in London.

Coined silver in the United States, on June 1, is estimated by the Treasury Department as follows: Standard dollars, $565,322,367; subsidiary coins, $169,884,577; total, $735,206,944. Of the dollars $483,223,000 are held against certificates outstanding.

SILVER AND STERLING EXCHANGE

June	13	14	15	17	18	19
New York	61⅛	61⅛	61⅜	61¼	61¼	61⅜
London	28 5/16	28 5/16	28¼	28 5/16	28 5/16	28⅛
Sterling Ex.	4.8720	4.8715	4.8730	4.8730	4.8750	4.8750

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver. 0.925 fine.

Exports of silver from London to the East, Jan. 1 to June 6, as reported by Messrs. Pixley & Abell:

	1911	1912	Changes	
India	£3,887,400	£2,989,800	D. £	897,600
China	822,800	853,500	I.	30,700
Total	£4,710,200	£3,843,300	D. £	866,900

India Council bills in London averaged 16.05d. per rupee for the week.

Copper, Tin, Lead and Zinc

NEW YORK

June	Copper: Lake, Cts. per lb.	Copper: Electrolytic, Cts. per lb.	Tin: Cts. per lb.	Lead: New York, Cts. per lb.	Lead: St. Louis, Cts. per lb.	Zinc: New York, Cts. per lb.	Zinc: St. Louis, Cts. per lb.
13	17⅜ @17⅝	17.20 @17.30	45	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75
14	17⅜ @17⅝	17.20 @17.30	45½	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75
15	17⅜ @17⅝	17.20 @17.30	45¼	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75
17	17⅜ @17⅝	17.20 @17.30	45¼	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75
18	17½ @17⅝	17.25 @17.35	45½	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75
19	17¼ @17⅝	17.35 @17 45	45½	4.50	4.40 @4.42½	6.80 @6.90	6.65 @6.75

The quotations for copper, lead, spelter and tin are for wholesale contracts with consumers, without distinction as to deliveries; and are representative, as nearly as possible, of the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. and that for casting copper usually about 0.125 to 0.2c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market for good ordinary brands, both desilverized and non-desilverized; specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium.

LONDON

June	Copper: Spot	Copper: 3 Mos	Copper: Best Sel'td	Tin: Spot	Tin: 3 Mos	Lead, Spanish	Zinc, Ordinaries
13	78 1/16	78 11/16	83¼	206½	196½	17¾	25¾
14	78⅛	78¾	83¼	204	195¾	17½	25¾
15	.....	.....	.....	.....	.....	.....	.....
17	79	79⅝	83½	207½	197½	17¾	25¾
18	79 3/16	80 3/16	84¼	207	197¼	17 11/16	25¾
19	80⅛	80½	85	206¼	196¾	17 11/16	25¾

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17½c.; £15 = 3.26c.; £25 = 5.44c.; £70 = 15.22c. Variations, ± £1 = ± 21¾c.

Copper—During the early part of the week the market was rather slack and electrolytic copper was easily obtainable at 17⅜@17½c., delivered, usual terms. The absence of nervousness on the part of domestic consumers in the face of the widely heralded strike at the Perth Amboy refinery was construed as indicating that they had well provided for their near-by requirements. On Monday the advance in the London standard market inspired a new buying movement from abroad and a fair volume of business resulted, leading some of the agencies to raise their price to 17⅝c., delivered, on Tuesday, which price was generally asked

on Wednesday, but with no considerable volume of business reported. Prime brands of Lake copper sold right along at 17½c. until Tuesday, when these producers also advanced their price. At the close, the market is strong and advancing. Lake copper is quoted 17½@17⅝c. and electrolytic in cakes, wirebars or ingots at 17.35@17.45c. Casting copper is quoted nominally 17.05@17.15c. as an average for the week.

The London standard market, which was £78 1s. 3d. for spot and £78 13s. 9d. on June 13, advanced to £79 for spot and £79 12s. 6d. for three months on June 17, and again 11s. 3d. further on June 18, and closes at £80 7s. 6d. for spot and £80 10s. for three months. The transactions have been large.

European statistics for the first half of June show a decrease in the visible supplies of 955 tons, which, in view of the large decrease during May and the small stock, further accentuates the strong statistical position of the article.

Copper sheets are 22@23c. per lb., base for large lots. Full extras are charged and higher prices for small quantities. Copper wire is 18½c. base, carload lots at mill.

Copper exports from New York for the week were 5482 long tons. Our special correspondent reports the exports from Baltimore at 1338 tons.

Visible stocks of copper in Europe June 15 are reported as follow: Great Britain, 29,560; France, 5910; Rotterdam, 1600; Hamburg, 5860; afloat from Chile, 1450; afloat from Australia, 5700; total, 50,080 long tons, or 112,179,200 lb. This is a decrease of 2510 tons from the May 31 report.

Tin—The London dock strike continues, and the stocks of tin at London have dwindled down to about 300 tons, which is less than they have ever been before. The scarcity of spot tin, both in London and here, is acute, and as there has been a virtual stoppage of shipments from London for almost a month, and as the London dock strike continues, a very acute situation seems to be confronting us. Spot tin in New York has ruled at about 3c. over tin for shipment. July tin is already beginning to command a premium. At the close, shipment tin is quoted 45½ cents.

The London market has been firm, and on June 17, spot advanced to £207 10s., futures to £197 10s. It closes at £206 5s. for spot and £196 15s. for three months.

The production of Billiton tin for the fiscal year ended Apr. 30 last, was 4484 long tons, an increase of 614 tons over the previous year.

Tin production of the Federated Malay States five months ended May 31 was 16,967 tons in 1911, and 19,114 in 1912; increase 2147 tons.

Messrs. Robertson & Bense report the arrivals of tin ore and concentrates at Hamburg, Germany, in May at 1651 tons from Bolivia.

Lead—The market is firm with a good business doing at last prices, 4.40@4.42½c., East St. Louis, and 4.50c., New York.

The foreign market is higher, Spanish lead being quoted at £17 18s. 9d., and English lead, 2s. 6d. higher.

Spelter—Consumption continues excellent and there is a good business doing from day to day. The market is somewhat firmer at 6.65@6.75c., East St. Louis, on the tonnage business with consumers.

The London market is unchanged, good ordinaries being quoted £25 15s., and specials, £26 per ton.

Base price of zinc sheets is $8.65 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8% discount.

Zinc dust is quoted at 7¼@7⅜c. per lb., New York, in carload lots.

Other Metals

Aluminum—Business continues rather quiet and sales have been only moderate. We continue to quote 22½@23c. per lb. for No. 1 ingots, New York.

The latest London quotation is £70@72 per long ton for ingots. This is equivalent to 15.21@15.65c. per lb., which is about on a parity with the New York price, freight and duty paid.

It is understood that the new agreement has received the assent of all of the European producers, but will not become fully effective until Jan. 1, 1913. An interim agreement will control the market until that time.

Antimony—Business is quiet and prices unchanged. Cookson's is quoted at 8.10c. per lb.; Hallett's is 7.75c.; while 7.10@7.25c. per lb. is quoted for Chinese. Hungarian and other outside brands.

Quicksilver—Business remains in good shape, with no change in prices. New York quotations are $41 per flask of 75 lb., with 60c. per lb. charged for retail lots. San Francisco, $41 for domestic orders and $38.50 for export. The London price is £8 5s. per flask, with £8 2s. 6d. quoted from second hands.

Cadmium—The latest quotations received is 700 marks per 100 kg., f.o.b. works in Silesia, Germany. This is equal to 75.6c. per lb., at works.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot from 50c. for 500-lb. lots up to 55c. for 200-lb. lots. The price of electrolytic is 5c. higher.

Zinc and Lead Ore Markets

Joplin, Mo., June 15—The high price of zinc sulphide ore this week was $61.50, the base per ton of 60% zinc is $54@58.50. Zinc silicate sold at $28@30 per ton of 40% zinc. The average price, all grades, was $55.32. The high price of lead ore is $58.50, and the average price, all grades, is $54.76 per ton.

The zinc-ore market held to the same prices as the previous week, but may be said to be slightly easier; the demand was not so strong this week.

By Telegraph—A Joplin despatch of June 17 reports floods over the entire district, cutting down production fully one-half. A second dispatch, June 18, says that the flood conditions are less serious than at first reported, and the curtailment of output not over one-third at most.

SHIPMENTS, WEEK ENDED JUNE 15

	Blende	Calamine	Lead Ore	Value
Webb City-Carterville	4,104,820	.....	1,225,940	$147,647
Joplin	2,121,470	.....	208,420	66,190
Duenweg	767,180	65,120	44,810	23,565
Galena	764,600	.....	51,760	21,778
Alba-Neck	509,480	.....	22,960	15,392
Spurgeon	118,160	296,440	81,590	9,878
Oronogo	397,360	.....	.....	8,924
Miami	205,630	.....	58,320	6,480
Granby	28,880	373,000	3,020	6,280
Jackson	210,040	.....	17,240	6,109
Carl Junction	192,340	.....	.....	5,673
Cave Springs	193,180	.....	.....	5,408
Springfield	168,000	.....	.....	4,800
Aurora	141,470	.....	.....	3,677
Lawton	60,980	.....	.....	1,707
Carthage	49,230	.....	.....	1,329
Totals	10,032,830	734,560	1,714,080	$334,837
24 weeks	243,346,170	14,602,510	41,407,210	$7,414,216

Blende val., the week, $276,869; 24 weeks, $6,072,774
Calamine, the week, 11,022; 24 weeks, 214,640
Lead value, the week, 46,946; 24 weeks, 1,126,802

MONTHLY AVERAGE PRICES

Month	Zinc Ore: Base Price		Zinc Ore: All Ores		Lead Ore: All Ores	
	1911	1912	1911	1912	1911	1912
January	$41.85	$44.90	$40.55	$43.54	$55.68	$58.92
February	40.21	45.75	39.16	43.31	54.46	52.39
March	39.85	51.56	38.45	49.25	54.57	54.64
April	38.88	52.00	37.47	50.36	56.37	54.18
May	38.25	55.30	36.79	53.27	55.21	52.45
June	40.50	.....	38.18	.....	56.49	.....
July	40.75	.....	38.36	.....	58.81	.....
August	42.50	.....	41.28	.....	60.74	.....
September	42.63	.....	41.29	.....	59.33	.....
October	42.38	.....	40.89	.....	54.72	.....
November	45.40	.....	43.25	.....	57.19	.....
December	44.13	.....	40.76	.....	62.03	.....
Year	$41.45	.....	$39.90	.....	$56.76	.....

NOTE—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

Platteville, Wis., June 15—The highest and also the base price paid this week for zinc ore was $56. The base price paid for lead ore was $53@54 per ton.

SHIPMENTS, WEEK ENDED JUNE 15

Camps	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Benton	961,600	.....	404,800
Shullsburg	789,550	.....	.....
Mineral Point	678,250	.....	.....
Platteville	476,060	.....	191,000
Hazel Green	420,000	.....	.....
Harker	300 400	.....	.....
Galena	241,700	80,400	.....
Cuba City	136,900	.....	81,500
Total	4,004,460	80,400	677,300
Year to date	94,414,600	3,834,510	13,062,170

Shipped during week to separating plants, 1,960,490 lb. zinc ore.

Chemicals

New York, June 19—General business is rather quiet and there is nothing new in the market.

Arsenic—Business is not particularly active and prices are unchanged at $3.87½ per 100 lb. for spot and $3.50 for futures. No Mexican arsenic has been received, but there have been some arrivals of English. The Anaconda Co. is not quoting prices at present and is believed to be pretty well sold up.

Copper Sulphate—The market is not over active but is firm. Quotations are unchanged at $5.50 per 100 lb. for carload lots and $5.75 per 100 lb. for smaller parcels. The troubles at the various refineries are interfering with the output.

Nitrate of Soda—The position in this article is firm and business is fair for the season. Prices are steady at 2.45c. per lb. for both spot and futures.

Messrs. Mortimer & Co., New York, report the position of nitrate in the United States on June 1 as follows, figures in long tons:

	1911	1912	Changes
Stocks, Jan. 1	12,790	9,000	D. 3,790
Imports, 5 mos.	253,312	163,300	D. 90,012
Total supplies	266,102	172,300	D. 93,802
Deliveries, 5 mos.	250,522	167,700	D. 82,822
Stocks, June 1	15,580	4,000	D. 10,980
Afloat for U. S.	93,000	125,000	I. 32,000

Quantities afloat include all cargoes due to arrive at United States ports before Sept. 15 next.

Petroleum

The monthly statement of the *Oil City Derrick* reports new wells completed in May as follows: Pennsylvania and West Virginia, 446; Lima-Indiana, 54; Kentucky, 16; Illinois, 91; Kansas-Oklahoma, 589; Texas-Louisiana, 123. In all the divisions there were 1321 wells completed, 158 more than in April. The new production was 53,944 bbl., a decrease from the April report of 10,784 bbl. There were 220 failures among the completed wells, and 120 gas wells, a total of 340, leaving 981 oil producers.

On the last day of May there were 513 rigs up and 1244 drilling wells, a total of 1757. This was an increase of 62 rigs and of 44 in wells drilling.

London dispatches report that the Nederlandsche Koloniale Petroleum Maatschappij, a new company organized by Standard Oil interests, has obtained some oil concessions in the Netherlands East Indies.

Mining Stocks

New York, June 19—On June 13 prices on the Exchange were firm but trading light and chiefly professional. On the Curb copper stocks were firm and fairly active. Cobalts were quiet with only fractional changes. There were heavy sales of El Paso Consolidated. Yukon Gold, which has been quiet for a long time, now shows large dealings at advancing prices.

June 14 there was something of a break in prices on the Exchange affecting most of the leading stocks. Mining stocks on the Curb were quiet with hardly any change in prices.

June 15 the Exchange was again quiet and rather irregular, but with no further recession in quotations. The Curb also was quiet with mining stocks in only moderate demand.

June 17 the Exchange was dull but strong, prices advancing on limited trading. The Curb was rather slow and decidedly irregular. The active mining stocks were Braden, British Columbia Copper, Butte & New York and El Paso Consolidated.

June 18 the Exchange was dull and uncertain, dealers being disposed to wait for the result of the Republican convention at Chicago. The Curb was dull, with little doing in mining stocks. June 19 conditions remained about the same

Mining and industrial securities listed on the New York Stock Exchange this week included $20,000,000 Baldwin Locomotive Works common stock; Guggenheim Exploration Co., 150,388 shares, $100 par value, with authority to add 57,545 shares on due notice. The last named stock has been dealt in on the Curb heretofore.

At auction in New York, June 13, the following securities were sold: Nevada-Utah Mines & Smelters Co., 100 shares, $10 par, $1 for the lot; Naica Mining Co. 2500 shares, $1 par, $6 for the lot, and 5000 shares $8 for the lot.

Boston, June 18—Even with copper at high prices the share market is almost stagnant. The political convention is attracting the general attention and the stock market is suffering from a state of apathy. Prices have shown quite general recessions, but even at that the metal-share market is one of good tone.

Butte & Superior has been the feature of the past week, rising $6.37½ to $51.75, with a fair reaction. American Zinc shares also rose sharply in sympathy with the move of the first named, advancing $2.50 to $33. There is talk of a consolidation of these two zinc properties and the listing of the holding company's stock in Paris. A prominent brokerage house is sponsor for both of these companies and recently underwrote stock issues of both.

Mayflower and Old Colony continue to be neglected and some days there have been no sales of one or the other. Late advices continue favorable. Hancock had a $2.75 advance to $37, which is its record price. Island Creek rose $6.25 to $65.75, reacting materially, and Pond Creek rose $1.50 to $19.87½ in sympathy. Other strong spots have been Isle Royale and Osceola. North Butte responded to

COPPER PRODUCTION REPORTS

Copper contents of blister copper, in pounds

Company	March	April	May
Alaska shipments	4,987,916	1,243,911	1,720,391
Anaconda	25,900,000	25,480,000	25,800,000
Arizona, Ltd.	3,150 000	3,400,000	3,500,000
Copper Queen	7,197,121	6,806,425	7,024,087
Calumet & Ariz.	4,652,000	4,104,000	4,424,000
Chino	1,108,381	.....	.....
Detroit	2,246,238	2,506,718	2,092,478
East Butte	1,480,000	.....	.....
Mammoth	1,939,310	1,718,450	.....
Mason Valley	1,140,000	.....	.....
Nevada Con.	6,380,000	6,115,095	.....
Ohio	599,156	.....	.....
Old Dominion	2,432,000	2,167,000	.....
Ray	2,300,000	2,611,920	2,992,500
Shannon	1,388,000	1,544,000	1,464,000
South Utah	299,000	284,215	236,884
United Verde*	2,250,000	2,250,000	2,500,000
Utah Copper Co.	8,160,000	8,615,775	.....
Lake Superior*	19,750,000	18,250,000	21,250,000
Non-rep. mines*	6,792,463	8,250,000	.....
Total production	104,051,585	.....	.....
Imports, bars, etc.	23,519,215	26,842,014	.....
Total blister	127,570,800	.....	.....
Imp. in ore & matte	8,736,874	9,350,972	.....
Total	136,307,674	.....	.....
Miami	2,755,000	2,554,352	2,565,000
Brit. Col. Cos.:			
British Col. Copper	.....	.....	.....
Granby	1,882,073	1,941,797	1,914,460
Mexican Cos.:			
Boleo	2,424,800	2,149,280	2,260,160
Cananea	2,834,000	4,654,000	.....
Moctezuma	2,446,731	2,797,718	2,892,521
Other Foreign:			
Cape Cop., S. Africa	725,760	954,240	754,880
Kyshtim, Russia	.....	1,545,000	.....
Spassky, Russia	638,400	649,600	.....
Famatina, Argen.	.....	.....	.....
Tilt Cove, Newf'd.	104,992	119,869	123,087
Exports from:			
Chile	3,584,000	6,496,000	3,696,000
Australia	8,064,000	9,408,000	7,840,000
Arrivals in Europe†	12,559,680	12,064,640	9,976,860

Figures are reports received from companies, unless otherwise stated. Bolco copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister.

Ohio Copper, Jan., 576,581; Feb., 661,757 lb.

*Estimated. †Does not include the United States, Australia or Chile.

STATISTICS OF COPPER.

Month	United States Product'n	Deliveries, Domestic	Deliveries for Export
V, 1911	126,962,544	64,543,963	61,978,557
VI	124,554,312	61,655,561	71,460,519
VII	112,167,934	56,982,582	74,880,658
VIII	125,493,667	59,935,364	69,855,660
IX	115,588,950	57,311,584	50,824,011
X	118,255,442	64,068,307	60,084,349
XI	111,876,601	68,039,776	67,049,279
XII	122,896,697	65,988,474	79,238,716
Year	1,431,938,338	709,611,605	754,902,233
I, 1912	119,337,753	62,343,901	80,167 904
II	116,035,809	56,228,368	63,148,096
III	125,694,601	67,487,466	58,779,566
IV	125,464,644	69,513,846	53.252,326
V	126,737,836	72,702,277	69,485,945

VISIBLE STOCKS

	United States	Europe	Total
VI, 1911	165,995,932	202,540,800	368,536,732
VII	157,434,164	195,932,800	353,366,964
VIII	137,738,858	191,891,840	329,630,698
IX	133,441,501	191,228,800	324,670,301
X	140,894,856	191,945,600	332,840,456
XI	134,997,642	176,825,600	311,823,242
XII	111,785,188	164,281,600	276,066,788
I, 1912	89,454,695	158,323,200	247,777,895
II	66,280,643	154,851,200	221,131,843
III	62,939,988	141,142,400	204,082,388
IV	62,367,557	136,819,200	199,186,757
V	65,066,029	134,176,000	199,242,029
VI	49,615,643	117,801,600	167,417,243

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

the increase in the quarterly dividend rate from 40 to 50c. by advancing $2.50 to $32.25. Heavy selling of Utah Consolidated knocked the price down $3 to $10, without bringing any definite news.

Curb trading has been of fair volume, but with unimportant price changes.

Assessments

Company	Delinq	Sale	Amt
Alpha Con., Nev.	May 29	June 19	$0.05
Andes, Nev.	May 28	June 18	0.05
Best & Belcher, Nev	June 3	June 27	0.10
Caledonia, Nev.	May 21	June 11	0.10
Challange, Nev.	June 8	July 2	0.10
Chollar, Nev.	July 7	Aug. 5	0.10
Crown Point, Nev.	June 24	July 17	0.10
East Tintic, Utah.	May 30	June 25	0.005
Ely Con., Nev.	.....	.....	0.05
Exchequer, Nev.	May 23	June 13	0.05
Federal Ely, Utah.	May 8	June 8	0.01
Glen Dale, Utah.	May 25	June 25	0.00
Great Falls, Utah.	June 26	July 27	0.002½
Hale & Norcross, Nev.	July 2	July 29	0.05
Houghton Copper, Mich.	May 17	.....	1.00
Julia, Nev.	May 15	June 5	0.05
Mineral Hill, Nev.	Aug. 5	Oct. 5	0.01
New York Bonanza, Utah.	May 8	.....	0.02
Overman, Nev.	June 29	July 23	0.10
Raven, Mont.	Feb. 1	.....	0.10½
Savage, Nev.	June 4	June 26	0.10
Segregated Belcher, Nev.	June 1	June 28	0.05
Seven Troughs, Nev.	June 15	July 2	0.002½
Sierra Nevada, Nev.	July 4	July 30	0.10
South Lake, Mich.	June 3	.....	2.00
Tintic Central, Utah.	June 14	July 6	0.005
Utah Antimony, Utah	June 1	.....	0.03
Yellow Jacket, Nev	July 4	Aug. 12	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1910	1911	1912	1910	1911	1912
January	52.375	53.795	56.260	24.154	24.865	25.887
February	51.534	52.222	59.043	23.794	24.081	27.190
March	51.454	52.745	58.375	23.690	24.324	26.875
April	53.221	53.325	59.207	24.483	24.595	27.284
May	53.870	53.308	60.880	24.797	24.583	28.038
June	53.462	53.043	.....	24.651	24.486	.....
July	54.150	52.630	.....	25.034	24.286	.....
August	52.912	52.171	.....	24.428	24.082	.....
September	53.295	52.440	.....	24.567	24.209	.....
October	55.490	53.340	.....	25.596	24.594	.....
November	55.635	55.719	.....	25.680	25.649	.....
December	54.428	54.905	.....	25.160	25.349	.....
Year	53.486	53.304	.....	24.670	24.592	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London, Standard	
	Electrolytic		Lake			
	1911	1912	1911	1912	1911	1912
January	12.295	14.094	12.680	14.337	55.600	62.760
February	12.256	14.084	12.611	14.329	54.974	62.893
March	12.139	14.698	12.447	14.868	54.704	65.884
April	12.019	15.741	12.275	15.930	54.034	70.294
May	11.989	16.031	12.214	16.245	54.313	72.352
June	12.385	.....	12.611	.....	56.365	.....
July	12.463	.....	12.720	.....	56.673	.....
August	12.405	.....	12.634	.....	56.266	.....
September	12.201	.....	12.508	.....	55.253	.....
October	12.189	.....	12.370	.....	55.170	.....
November	12.616	.....	12.769	.....	57.253	.....
December	13.552	.....	13.768	.....	62.068	.....
Year	12.376	.....	12.634	.....	55.973	.....

New York, cents per pound, London, pounds sterling per long ton of standard copper.

TIN AT NEW YORK

Month	1911	1912	Month	1911	1912
January	41.255	42.529	July	42.400	.....
February	41.614	42.962	August	43.319	.....
March	40.157	42.577	September	39.755	.....
April	42.185	43.923	October	41.185	.....
May	43.115	46.053	November	43.125	.....
June	44.606	.....	December	44.655	.....
			Av. Year	42.281	.....

Prices are in cents per pound.

LEAD

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	4.483	4.435	4.334	4.327	13.009	15.619
February	4.440	4.026	4.266	3.946	13.043	15.738
March	4.394	4.073	4.238	4.046	13.122	15.997
April	4.412	4.200	4.262	4.118	12.889	16.351
May	4.373	4.194	4.223	4.072	12.984	16.509
June	4.435	.....	4.292	.....	13.260	.....
July	4.499	.....	4.397	.....	13.530	.....
August	4.500	.....	4.406	.....	14.260	.....
September	4.485	.....	4.356	.....	14.744	.....
October	4.265	.....	4.139	.....	15.332	.....
November	4.298	.....	4.181	.....	15.821	.....
December	4.450	.....	4.332	.....	15.648	.....
Year	4.420	.....	4.286	.....	13.970	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1911	1912	1911	1912	1911	1912
January	5.452	6.442	5.302	6.292	23.887	26.642
February	5.518	6.499	5.368	6.349	23.276	26.661
March	5.563	6.626	5.413	6.476	23.016	26.048
April	5.399	6.633	5.249	6.483	23.743	25.644
May	5.348	6.679	5.198	6.529	24.375	25.790
June	5.520	.....	5.370	.....	24.612	.....
July	5.695	.....	5.545	.....	25.006	.....
August	5.953	.....	5.803	.....	26.801	.....
September	5.869	.....	5.719	.....	27.750	.....
October	6.102	.....	5.951	.....	27.256	.....
November	6.380	.....	6.223	.....	26.795	.....
December	6.301	.....	6.151	.....	26.849	.....
Year	5.758	.....	5.608	.....	25.281	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON AT PITTSBURG

Month	Bessemer		Basic		No. 2 Foundry	
	1911	1912	1911	1912	1911	1912
January	$15.90	$15.12	$14.40	$13.32	$14.75	$14.00
February	15.90	15.03	14.50	13.28	14.81	14.01
March	15.90	14.95	14.65	13.66	14.96	14.10
April	15.90	15.13	14.65	13.90	15.00	14.15
May	15.90	15.14	14.30	13.90	14.72	14.12
June	15.90	.....	14.06	.....	14.56	.....
July	15.90	.....	14.03	.....	14.53	.....
August	15.90	.....	14.00	.....	14.47	.....
September	15.90	.....	13.57	.....	14.40	.....
October	15.43	.....	13.44	.....	14.34	.....
November	14.92	.....	13.30	.....	14.25	.....
December	15.15	.....	13.10	.....	13.90	.....
Year	$15.72	.....	$13.94	.....	$14.49	.....

STOCK QUOTATIONS

COLO. SPRINGS June 18

Name of Comp.	Bid.
Acacia	.06
Cripple Cr'k Con.	.01⅞
C. K. & N.	.17
Doctor Jack Pot	.05½
Elkton Con.	.55⅞
El Paso	.97½
Findlay	.05
Gold Dollar	.17
Gold Sovereign	.01
Isabella	.12¼
Jack Pot	.04
Jennie Sample	.05
Lexington	‡.02
Moon Anchor	.01
Old Gold	.03½
Mary McKinney	.72
Pharmacist	.01⅜
Portland	.90
Vindicator	.85
Work	.01⅛

SALT LAKE June 18

Name of Comp.	Bid.
Beck Tunnel	.10
Black Jack	.13
Cedar Talisman	.02
Colorado Mining	.15½
Columbus Con.	.27
Crown Point	.02½
Daly-Judge	5.75
Grand Central	.63
Iron Blossom	1.22½
Little Bell	.41
Lower Mammoth	.01
Mason Valley	‡11.50
May Day	.10½
Nevada Hills	‡1.95
New York	‡.04½
Prince Con	1.62½
Silver King Coal'n	2.50
Sioux Con.	.06
Uncle Sam	.20
Yankee	‡.10

TORONTO June 18

Name of Comp.	Bid	Name of Comp.	Bid
Coniagas	7.20	Hollinger	11.10
Hudson Bay	‡70.00	Imperial	.02
Temiskaming	.40	Pearl Lake	.16
Wettlaufer-Lor.	.59	Porcu. Gold	.35
Apex	.04	Porcu. Tisdale	.02
Central	‡5.56	Preston E. D.	.04
Crown Chartered	.13	Rea	.30
Dobie	.20	Standard	‡.02½
Dome Exten.	.29	Swastika	.14
Foley O'Brien	.18	West Dome	.15

SAN FRANCISCO June 18

Name of Comp.	Clg.	Name of Comp.	Bid
COMSTOCK STOCKS		MISC. NEV. & CAL.	
Alta	.06	Belmont	9.90
Belcher	.60	Jim Butler	.55
Best & Belcher	.13	MacNamara	.24
Caledonia	‡1.40	Midway	.40
Challenge Con.	.13	Mont.-Tonopah	2.24
Chollar	.02	North Star	.15
Confidence	.40	West End Con.	1.65
Con. Virginia	.54	Atlanta	.21
Crown Point	.37	Booth	.08
Gould & Curry	.03	C.O.D. Con.	.10
Hale & Norcross	.12	Comb. Frac.	.14
Mexican	2.72	Jumbo Extension	.35
Occidental	.55	Pitts.-Silver Peak	1.25
Ophir	1.12½	Silver Pick	.11
Overman	.62	St. Ives	.33
Potosi	.04	Tramp Con.	‡.01
Savage	.13	Argonaut	‡2.00
Sierra Nevada	.15	Bunker Hill	‡4.50
Union Con.	.66	Cent. Eureka	.50
Yellow Jacket	.46	So. Eureka	‡3.50

N. Y. EXCH. June 18

Name of Comp.	Clg.
Amalgamated	85⅜
Am. Agri. Chem.	61½
Am.Sm.&Ref.,com	84½
Am. Sm. & Ref., pf.	107⅝
Am. Sm. Sec., pf. B	89½
Anaconda	43⅝
Batopilas Min.	1⅝
BethlehemSteelpf	69½
Chino	34½
Comstock Tunnel	‡.10
Federal M. & S., pf.	41⅝
Goldfield Con.	4½
GreatNor.,ore,ctf.	40½
Guggen. Exp.	60¾
Homestake	94
Inspiration Con.	19⅛
Miami Copper	28⅜
Nat'nalLead,com.	57¼
National Lead, pf.	107⅛
Nev. Consol.	22
Pittsburg Coal, pf.	89
Ray Con.	21
RepublicI&S,com.	23¾
Republic I & S, pf.	79
SlossSheff'd,com.	54⅜
Sloss Sheffield, pf.	98
Tennessee Copper	44
Utah Copper	63⅞
U. S. Steel, com	69⅛
U. S. Steel, pf.	110⅜
Va. Car. Chem.	48

N. Y. CURB June 18

Name of Comp.	Clg.
Barnes King	‡.30
Beaver Con.	.46
Braden Copper	7¾
B. C. Copper	6
Buffalo Mines	‡1⅛
Caledonia	⅜
Con. Ariz. Sm.	⅝
Davis-Daly	2⅛
Diam'field-Daisy	8
Ely Con.	¼
Florence	.95
Giroux	5⅛
Gold Hill Con.	⅜
Greene Cananea	10
Greenwater	‡.06
Internat. S. & R.	124
Kerr Lake	2⅛
Keystone	3
La Rose	3¾
McKinley-Dar-Sa.	1⅛
Min. Co. of A. new	3
Motherlode Gold.	⅛
Nev. Utah M. & S.	.03⅛
Nipissing Mines	7¾
Ohio Copper	1⅛
Pacific Sm. & M.	⅛
South Live Oak	3⅝
South Utah M. & S.	¾
Standard Oil (Old)	910
Stand'd Oil of N.J.	382
Stand'd Oil Subs.	510
Stewart	1⅜
Tonopah	7⅛
Tonopah Ex.	1⅛
Tri-Bullion	⅛
Tularosa	‡1⅛
Union Mines	⅛
United Cop., pfd.	10
Yukon Gold	3⅜

LONDON June 19

Name of Com.	Clg.
Camp Bird	£1 9s 3d
Dolores	1 10 0
El Oro	0 16 6
Esperanza	1 11 3
Mexico Mines	7 5 0
Oroville	0 4 6
Stratton'sInd.	0 3 1½
Tomboy	1 5 0

BOSTON EXCH. June 18

Name of Comp.	Clg.
Adventure	9¾
Ahmeek	355
Algomah	6½
Allouez	47
Am. Zinc	31¾
Ariz. Com., ctfs.	5⅞
Bonanza	.40
Boston & Corbin	8
Butte & Balak	3¾
Calumet & Ariz	75¼
Calumet & Hecla	524
Centennial	24¾
Con. Mercur	‡.05
Copper Range	58¼
Daly West	5½
East Butte	13¼
Franklin	13
Granby	54½
Hancock	36¼
Hedley Gold	17½
Helvetia	1⅛
Indiana	19¼
Island Cr'k, com.	59
Island Cr'k, pfd.	90
Isle Royale	32
Keweenaw	1¾
Lake	39
La Salle	7
Mass	7
Michigan	3
Mohawk	67½
New Arcadian	4¼
New Idria Quick.	‡6⅞
North Butte	31¾
North Lake	6½
Ojibway	4⅝
Old Dominion	58¼
Osceola	125
Quincy	90
Shannon	15
Shattuck-Ariz.	22¼
Superior	40
Superior & Bost.	2¼
Tamarack	43
Trinity	7¾
Tuolumne	4
U. S. Smelting	39½
U. S. Smelt'g, pf.	49
Utah Apex	2⅛
Utah Con.	11
Victoria	4¼
Winona	‡6⅞
Wolverine	112
Wyandot	2½

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Name of Comp.	Last
Bingham Mines	2⅜
Boston Ely	1⅝
Boswyocolo	.02½
Butte Central	6½
Cactus	.10
Calaveras	2⅝
Chief Cons	1⅜
Corbin	1⅛
Cortez	1⅛
Crown Reserve	3⅜
First Nat. Cop.	2⅞
Majestic	.56
Mazatan	⅛
Moneta Porc.	‡.11
Nevada-Douglas	3⅛
New Baltic	3
Oneco	2⅞
Raven Copper	.30
Rhode Island Coal	.29
San Antonio	‡3
S. W. Miami	7⅛
South Lake	9⅞
Trethewey	.45
United Verde Ext.	.43
Vulture	‡5.00

‡Last quotation.